

State of California
California Environmental Protection Agency

Air Resources Board
Transportation & Toxics Division
P.O. Box 2815
Sacramento, California 95812-2815

DESCRIPTION OF
HARP 2 HEALTH RISK ASSESSMENT
INPUT AND OUTPUT FILES



Last Revised: March 6, 2015

TABLE OF CONTENTS

1. Overview	1
2. HRAInput.hra File	3
A. Opening and Viewing Content	3
B. Understanding File Content	4
C. HRA Header	6
D. Risk Scenario Inputs.....	9
E. Pathway Inputs	16
1. Pathways Enabled in HRA	18
2. Inhalation.....	19
3. Soil and Dermal Exposure.....	21
4. Human Drinking Water	22
5. Homegrown Produce.....	23
6. Fish	24
7. Fraction of Diet from Animal Products.....	25
8. Beef and Dairy Cow Drinking Water.....	26
9. Beef and Dairy Cow Diet	27
10. Pig, Chicken, and Egg Drinking Water	27
F. Tier 2 Inputs	30
1. Exposure Frequency	32
2. Inhalation.....	32
3. Soil	33
4. Dermal.....	34
5. Mother's Milk	35
6. Water.....	36
7. Fish	37
8. Homegrown Produce.....	38
9. Beef, Dairy, Pig, Chicken, & Egg.....	40
3. PoIDB.csv File	42
A. Opening and Viewing Content	42

B. Understanding File Content	43
1. Pollutant Identification	46
2. Cancer Risk Factors & RELs by Inhalation	47
3. Is Pollutant Multipathway.....	49
4. Risk to Target Organs by Acute Exposure	50
5. Risk to Target Organs by Chronic Inhalation Exposure.....	53
6. Risk to Target Organs by Chronic Oral Exposure	57
7. Pathways of Exposure.....	61
8. Uptake from Soil by Vegetation	64
9. Pollutant to Animal Food Product Transfer Coefficients	65
10. Absorption Factors & Molecular Weight Correction.....	66
11. Risk to Target Organs by Chronic 8-Hr Inhalation Exposure.....	68
12. Pollutant to Mother's Milk Transfer Coefficients	73
13. Chemical Group	74
4. GLCList.csv File	75
A. Opening and Viewing Content	75
B. Understanding File Content	75
5. OUTPUT.txt File	77
A. Opening and Viewing Content	77
B. Understanding File Content	78
6. Risk.csv File	79
A. Opening and Viewing Content	79
B. Understanding Cancer Risk File Content.....	79
1. Pollutant Identification	81
2. Annual Average Concentration	82
3. Cancer Risk Sum Probability.....	83
4. Cancer HRA Scenario	84
5. Cancer Risk Breakdown by Pathway	85
6. Pasture, Fish, and Water GLCs	87
C. Understanding Noncancer Risk File Content.....	88
1. Pollutant Identification	89

2. Concentration	90
3. Noncancer HRA Scenario	91
4. Hazard Index by Target Organ	92
5. Pollutant Dose by Pathway	94
6. Pasture, Fish, & Water GLCs	97

LIST OF TABLES

Table 1-1. Difference Between Input and Output Risk Files	2
Table 1-2. Files Generated and Purpose	3
Table 2-1. HRA File Information Tags.....	9
Table 2-2. Risk Scenario Input Tags.....	15
Table 3-1. Column Groups in PolDB File	44

1. Overview

The purpose of this document is to guide you through the risk results input and output files generated in HARP 2. HARP 2 is comprised of three programs referred to as the Emission Inventory Module (EIM), Air Dispersion Modeling and Risk Assessment Tool (ADMRT), and the Health Risk Assessment Standalone Tool (RAST). Risk results files are generated by ADMRT and RAST. For the purpose of this document, the two programs will be referred to collectively as HARP 2.

The risk files are saved to the output directory you designated in HARP 2.

Output Files & Calculate Risk

Load an existing HRA Input File (*.hra)

Filename prefix for all outputs:

Filename	Description
abcHRAInput.hra	Input file containing risk scenario and site-specific information
abcPolDB.csv	Supplemental input file containing pollutant specific information (e.g., health values)
abcGLCList.csv	Supplemental input file containing ground level concentrations
abcOUTPUT.txt	Output log file
abcCancerRisk.csv	Output file containing cancer risk details

Calculate

Two kinds of files are produced: input files and output files. For example, **HRAInput.hra** is an input file, and **Risk.csv** is an output file.

Description
Input file containing risk scenario and site-specific information
Supplemental input file containing pollutant specific information (e.g., health values)
Supplemental input file containing ground level concentrations
Output log file
Output file containing cancer risk details

Table 1-1 describes the differences between input and output files.

Table 1-1. Difference Between Input and Output Risk Files		
	Input Files	Output Files
Description	Input files are those files that can be loaded into the module to recreate your health risk assessment (HRA) settings. This can be done by clicking FileLoad Input File on the left of the module's ribbon.	Output files are those files containing your risk results: risk sums and hazard index numbers for cancer and noncancer health risk assessments. They may be loaded into the View Risk Results screen if you wish to see results in the module instead of in CSV format.
Files	<ul style="list-style-type: none"> • HRAInput.hra files • PolDB.csv files • GLCList.csv files 	<ul style="list-style-type: none"> • Output Log file • All Risk.csv files <ul style="list-style-type: none"> ○ CancerRisk.csv ○ NCChronicRisk.csv ○ NCChronic8HrRisk.csv ○ NCAcuteRisk.csv

Table 1-2 describes the risk files made by HARP 2.

Table 1-2. Files Generated and Purpose

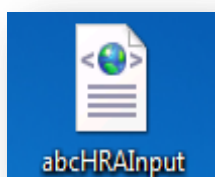
<i>File</i>	<i>File Type</i>	<i>Purpose</i>
HRAInput	XML	The HRA input file contains risk scenario and site-specific information. The file will display as an expandable and collapsible set of text with inputs and directories to additional input files used to generate your risk results.
PoIDB	CSV	The pollutant data base is an input file containing pollutant-specific health information that was pulled from the database of health values (HEALTH.mdb) included in your HARP 2 download package. The PoIDB.csv includes cancer slope factors, RELs, and pathway routes.
GLCList	CSV	The ground level concentration (GLC) List is a supplemental input file containing ground level concentrations of facility-emitted pollutants.
OUTPUT	TXT	The output file log will summarize the run content and verify the inputs loaded successfully when risk is calculated.
CancerRisk	CSV	The risk file is an output file containing cancer and noncancer risk details. It will contain data either for a cancer, noncancer (NC) chronic, NC chronic 8-hour, or NC acute risk assessment.

2. HRAInput.hra File

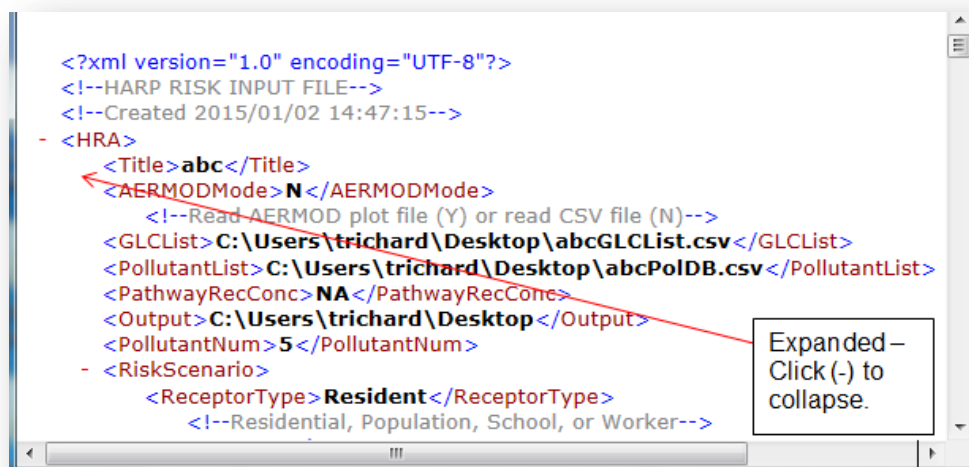
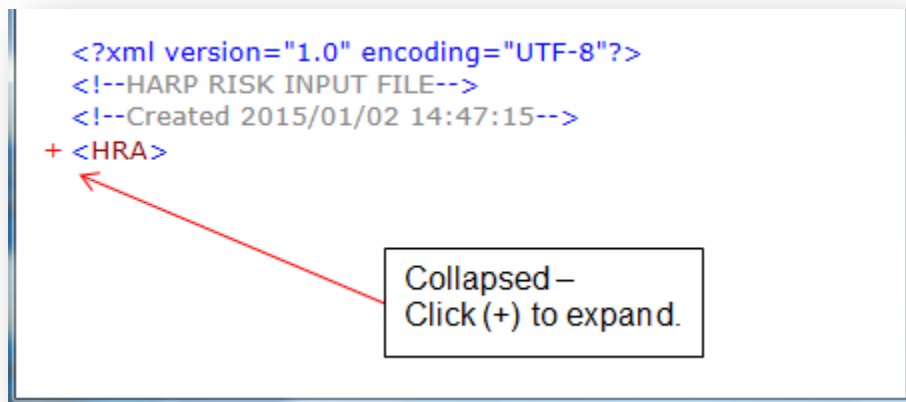
This section describes the HRAInput.hra file elements. An inhalation-only cancer risk assessment file is used as an example.

A. Opening and Viewing Content

Find the location at which you saved the HRAInput.file and double-click its icon to open. The filename will begin with the prefix you designated in HARP 2. In our example the prefix **abc** is used, producing the filename **abcHRAInput**.



The input file may be opened in a text editor. Click the left hand + symbol to expand content. Click the - symbol to collapse content.



B. Understanding File Contents

There are four main components to the HRAInput.xml file.

- Health risk assessment (HRA) file details
- Risk scenario inputs
- Pathways inputs
- Tier 2 inputs

The image shows a text editor window displaying an XML file. The XML content is as follows:

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <!--HARP RISK INPUT FILE-->
3  <!--Created 2015/02/24 14:38:49-->
4  - <HRA>
5      <HRAVERSION>15054</HRAVERSION>
6      <Title>abc</Title>
7      <AERMODMode>N</AERMODMode>
          <!--Read AERMOD plot file (Y) or read CSV file (N)-->
      <GLCList>C:\Users\trichard\Desktop\abcGLCList.csv</GLCList>
      <PollutantList>C:\Users\trichard\Desktop\abcPolDB.csv</PollutantList>
      <PathwayRecConc>NA</PathwayRecConc>
      <Output>C:\Users\trichard\Desktop</Output>
      <PollutantNum>5</PollutantNum>
      + <RiskScenario>
      + <Pathways>
      + <Tier2>
  </HRA>
  
```

Four callout boxes with red arrows point to specific parts of the XML:

- 1. File details and locations:** Points to the first seven lines of the XML, which contain the XML declaration, comments, and the opening <HRA> tag.
- 2. Risk scenario inputs:** Points to the <RiskScenario> tag.
- 3. Pathways inputs:** Points to the <Pathways> tag.
- 4. Tier 2 inputs:** Points to the <Tier2> tag.

The HRAInput.hra is a file with text. It is an Extensible Markup Language (XML) file that stores the HRA inputs and pathways to other inputs that produce your risk results. Thus, it may be reloaded into HARP 2 to reproduce the settings you once had. The body of text in the HRAInput.xml file contains tags (like categories) denoted by an opening `<>` and closing `</>` tag. The contents specific to your HRA are written in between the tabs, in **black**. There are many tags in the HRAInput.xml file, and each one will be covered here.

C. HRA Header

- Note: The **green numbers** on the left are there to assist you with following along.

The very top of the XML file states the XML version and the format used to encode characters in the document. **HARP RISK INPUT FILE** tells you file-type, and underneath is the date of creation. In this case, the HRAInput.xml file was created on October 17, 2014.

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <!--HARP RISK INPUT FILE-->
3 <!--Created 2014/10/17 10:47:57-->
```

<HRAVERSION> indicates what version of HARP 2 was used.

The **<Title>** tag encompasses the prefix that will stand at the beginning of each filename for your particular risk assessment. In this example, it is **abc**, resulting in the document filename: abcHRAInput.xml.

<AERMODMode> will always be turned off (**N**) in RAST; however it will be turned on (**Y**) in ADMRT. AERMOD is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. It may be used to calculate risk in the ADMRT module.

```
4 <HRA>
5   <HRAVERSION>15054</HRAVERSION>
6   <Title>abc</Title>
7   <AERMODMode>N</AERMODMode>
8   <!--Read AERMOD plot file (Y) or read CSV file (N)-->
```

The **<GLCList>** and **<PollutantList>** tag shows where information about the facility pollutants are saved. In this example, both files are saved to the **Desktop** in the **C:** drive. These pathways serve as an address so that when the HARP 2 loads HRA inputs, the program also knows where to pull pollutant concentrations and health values from.

<GLCList> finds the file with ground level concentrations data and **<PollutantList>** finds the file with HRA data.

- Note: In the instance a pathway has been changed (i.e. the file is saved to a new location), pollutant information can be manually reloaded from HARP 2.

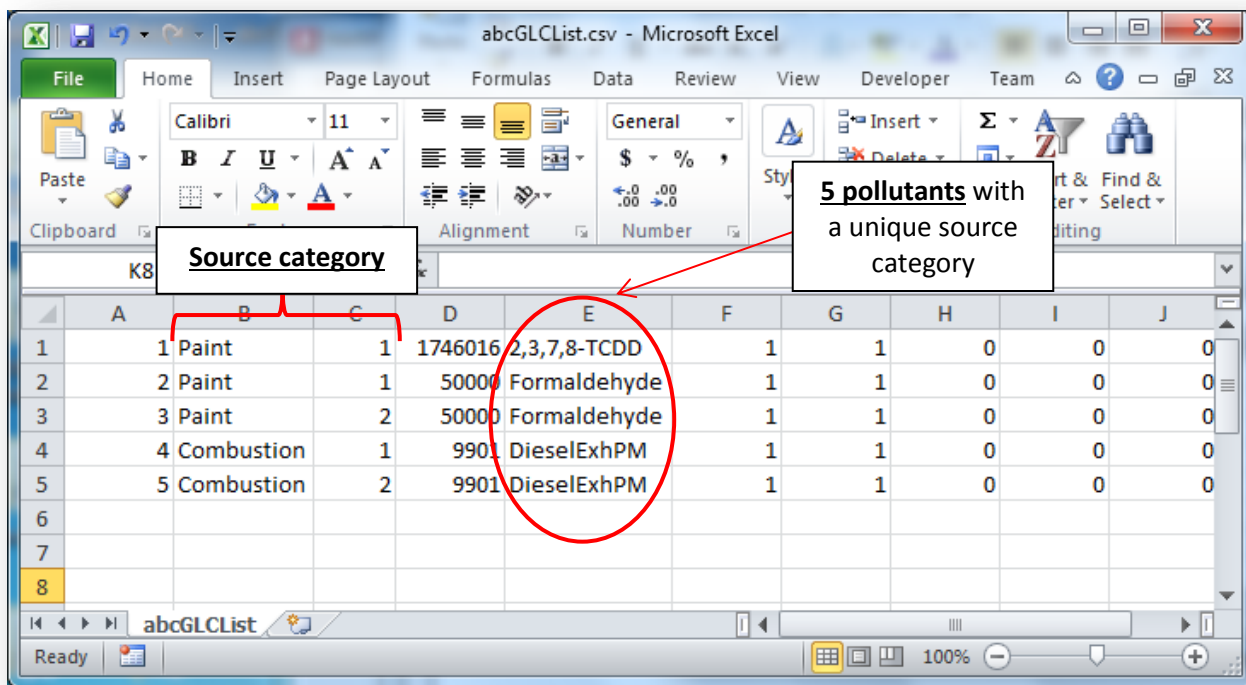
```
9 <GLCList>C:\Users\trichard\Desktop\abcGLCList.csv</GLCList>  
10 <PollutantList>C:\Users\trichard\Desktop\abcPolDB.csv</PollutantList>
```

<PathwayRecConc> will always be marked as not available (**NA**) in RAST. In ADMRT, however, it designates the pathway to pollutant data used with **<AERMODMode>**.

<Output> is the location where HRA files are originally saved.

The **<PollutantNum>** tag is the number of pollutants emitted from a particular source category. This equates to the total number of rows in the GLCList.csv file.

```
11 <PathwayRecConc>NA</PathwayRecConc>  
12 <Output>C:\Users\trichard\Desktop</Output>  
13 <PollutantNum>5</PollutantNum>
```



In this example, there are a total of three pollutant types:

1. 2,3,7,8-TCDD
2. Formaldehyde
3. Diesel Exhaust PM

However, there are five pollutants coming from a unique source category. For example, this facility has two Formaldehyde pollutants with a unique source category:

Pollutant Number	Pollutant	Source Category (e.g., process, coordinates)
1	Formaldehyde	Paint 1
2	Formaldehyde	Paint 2

Therefore, the pollutant number in this table is **2**. Adding up the rest of the pollutants in the GLC spreadsheet will sum up to 5 as **<PollutantNum>5</PollutantNum>** displays.

Table 2-1 summarizes the meaning of each element within the **<HRA>** text block.

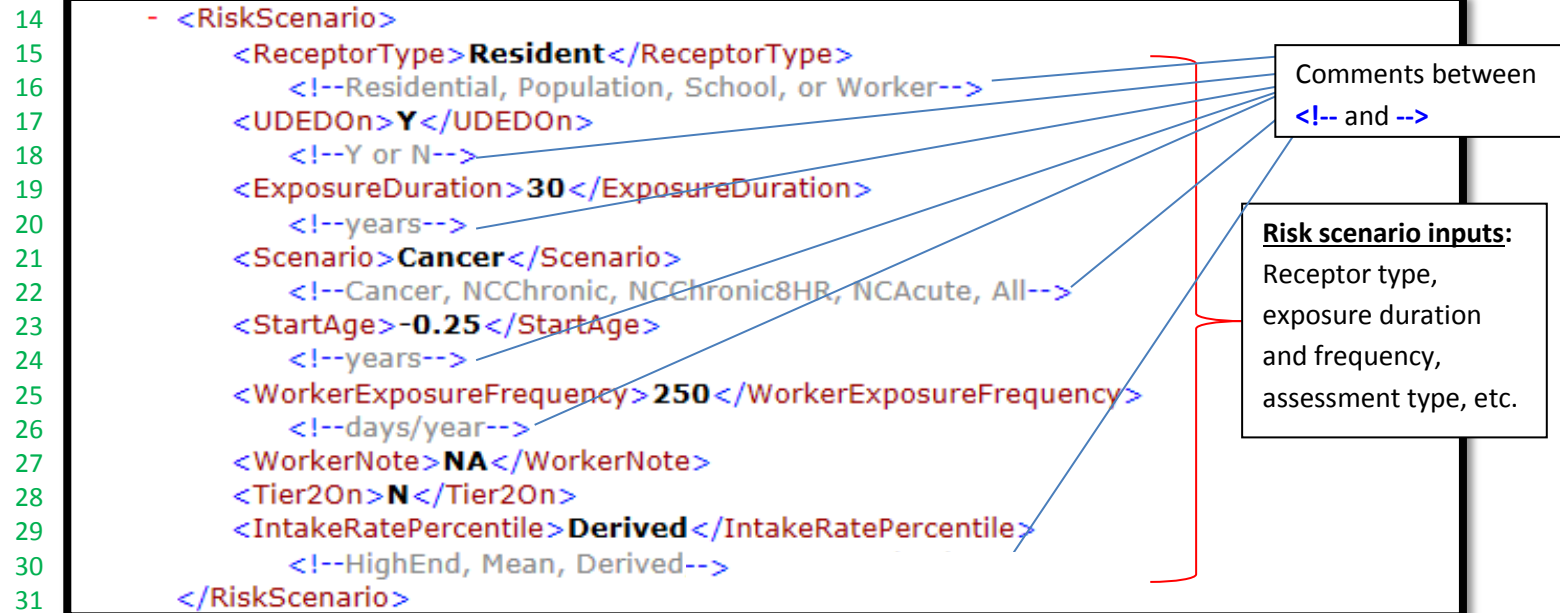
Table 2-1. HRA File Information Tags

Tag	Meaning
<Title>	The title element is the prefix you that precedes all of the corresponding files to your health risk assessment. In this example, it is abc and precedes the names of all files that were created (abcPolDB.csv, etc.).
<AERMODMode>	AERMOD mode is a plume model used in ADMRT. It will always be turned off (N) in RAST.
<GLCList>	The GLC list shows the location at which GLCList.csv is saved.
<PollutantList>	The pollutant list label indicates the location at which the PolDB.csv file was originally saved.
<PathwayRecConc>	This tag will always be not available (NA) in RAST. It is used with AERMOD Mode in the ADMRT.
<Output>	The Output indicates the location at which the HRAInput.xml is originally saved.
<PollutantNum>	The pollutant number is the number of pollutants emitted from an individual source. This equates to the total number of rows in the GLCList.csv file.

D. Risk Scenario Inputs

- Note: **Green numbers** on the left are there to assist you with following along.

<RiskScenario> inputs are followed by help comments between the symbols <!-- and -->. For example, <!--Residential, Population, School, or Worker--> is a comment naming the receptor options available for the <ReceptorType>Resident</ReceptorType> element.

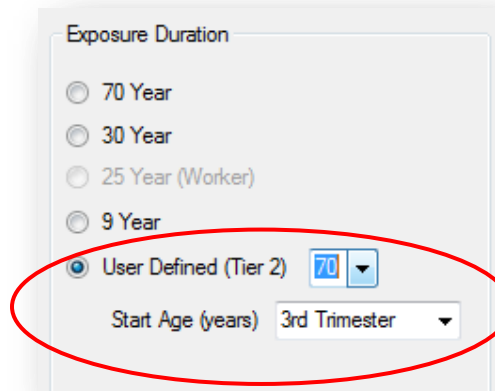


Risk scenario inputs begin with the **<RiskScenario>** tag.

The **<ReceptorType>** shows which receptor was evaluated for risk out of *Residential, Population, School, or Worker*. In this example, it is a **Resident**.

```
14 - <RiskScenario>
15   <ReceptorType>Resident</ReceptorType>
16   <!--Residential, Population, School, or Worker-->
17   <UDEDOn>N</UDEDOn>
18   <!--Y or N-->
```

<UDEDOn>N</UDEDOn> shows whether a user-defined exposure duration (UDED) was used instead of a default exposure duration and start age. As shown above, it is off (**N**).



Exposure Duration

☐ 70 Year

☐ 30 Year

☐ 25 Year (Worker)

☐ 9 Year

☒ User Defined (Tier 2) 70

Start Age (years) 3rd Trimester

The **<ExposureDuration>** tag designates the number of years the receptor (**Resident**) was exposed to the pollutants. In this example it is **30** years.

<Scenario>Cancer</Scenario> shows that cancer risk was calculated, as opposed to noncancer risk.

Because a user-defined exposure **<UDEDOn>** was not selected in this scenario, the default **<StartAge>** for the **Resident** receptor is the third trimester at **-0.25** years. When a worker receptor is being evaluated, the default start age is 16 years.

```
19 <ExposureDuration>30</ExposureDuration>
20 <!--years-->
21 <Scenario>Cancer</Scenario>
22 <!--Cancer, NCChronic, NCChronic8HR, NCAcute, All-->
23 <StartAge>-0.25</StartAge>
24 <!--years-->
```


Inputs that are not used will still be displayed in the input file. Although this HRA is for a **Resident** exposure, **Worker** assessment tags will be visible and filled with default values (**250**, **NA**, and **N**). Therefore, **<WorkerExposureFrequency>**, **<WorkerNote>**, and **<Tier2On>** are not active unless the **<ReceptorType>** is a **Worker**.

<WorkerExposureFrequency> is the number of days in a year a worker is exposed to pollutants.

<WorkerNote> will contain a note typed by the user in HARP 2 to explain why a UDED was used. For example, a note might specify that the receptor is a seasonal worker. In this case, a worker note was not entered, so **<WorkerNote>** shows 'not available' (**NA**).

```
25 <WorkerExposureFrequency>250</WorkerExposureFrequency>
26 <!--days/year-->
27 <WorkerNote>NA</WorkerNote>
28 <Tier2On>N</Tier2On>
```

<Tier2On> shown above, indicates whether or not the **Use adjustment factors** box was used for worker or 8-hour chronic assessments. In this assessment it was not used (**N**).

Adjustments for worker or 8-hour chronic risk

☒ Use adjustment factors

GLC adjustment factor: 1

Exposure frequency (days/year): 250

Reason for change

The **<IntakeRatePercentile>Derived</IntakeRatePercentile>** shows that, of the high end, mean, and derived intake rate methods, **Derived** was used.

```
29 <IntakeRatePercentile>Derived</IntakeRatePercentile>
30 <!--HighEnd, Mean, Derived-->
31 </RiskScenario>
```

Table 2-2 shows all of the **</RiskScenario>** tags.

Table 2-2. Risk Scenario Input Tags

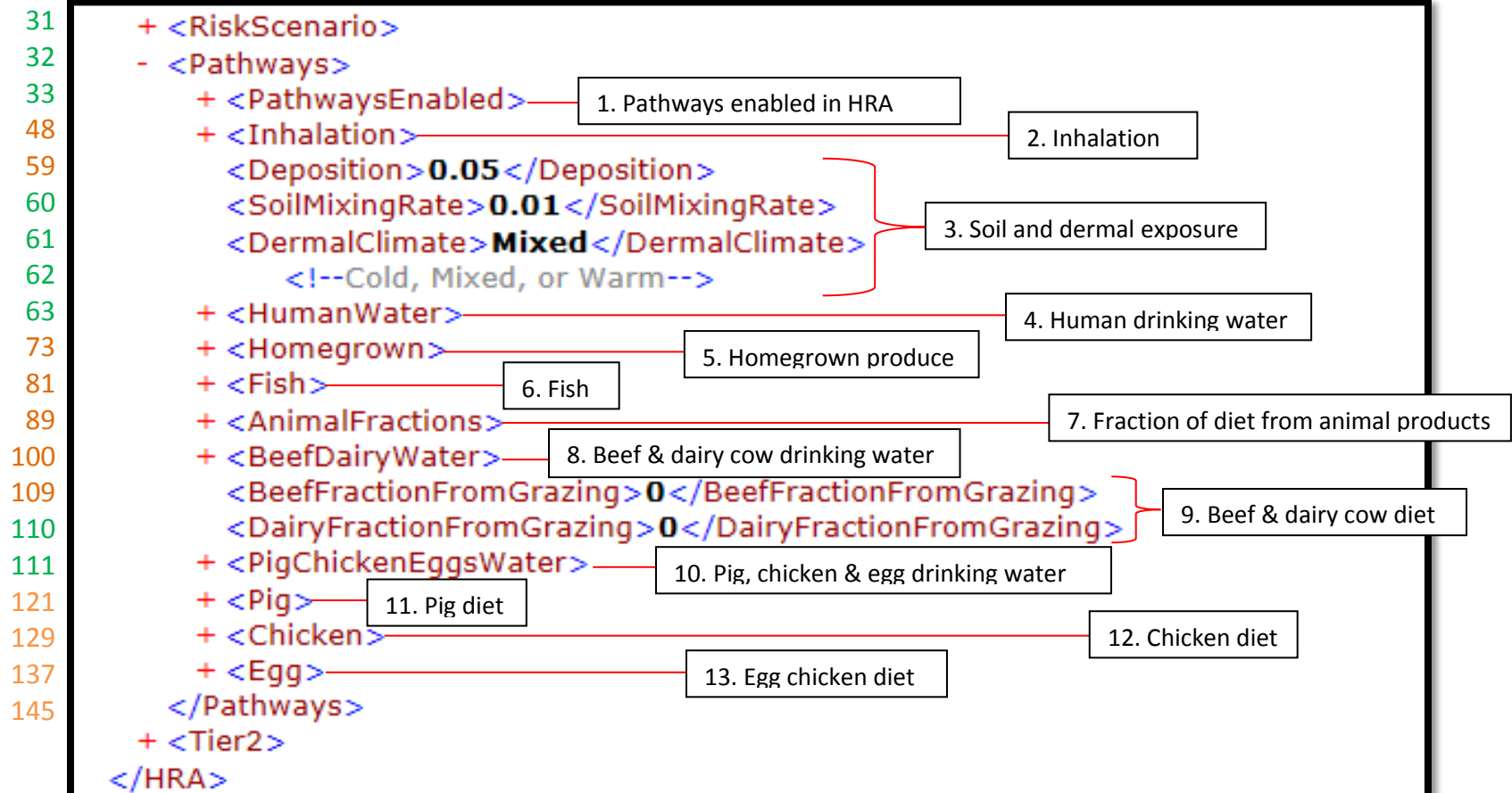
Tag	Meaning
<ReceptorType>	The receptor type is the location type at which a human occupant is exposed to facility pollutants.
<UDEDOn>	The user defined exposure duration on shows whether or not the user chose to designate a special exposure time to pollutants as opposed to regular exposure duration options.
<ExposureDuration>	Exposure duration is the number of years the receptor is exposed to the facility's pollutants.
<Scenario>	The scenario tag indicates which type of HRA was evaluated: cancer, noncancer chronic, noncancer chronic 8-hour, noncancer acute, or all.
<StartAge>	The start age shows at what age (in years) exposure to the pollutants began. If the Start Age begins in the third trimester, it will display as -0.25 .
<WorkerExposureFrequency>	Worker exposure frequency is the number of days per year the receptor is exposed to facility pollutants, typically used in a worker scenario.
<WorkerNote>	The worker note, when used, will show what the user typed in the module to explain the reason for a user-defined exposure duration and/or ground level concentration.
<Tier2On>	Tier 2 on will show Y if the Use adjustment factors box was selected.
<IntakeRatePercentile>	The intake rate percentile is the method used to determine the intake rate of pollutants.

E. Pathway Inputs

Following the risk scenario inputs are the **<Pathways>** inputs. This block of text contains settings used to define exposure routes to your pollutants. The inhalation pathway is always on, and additional pathways may be added.

The main components of the **<Pathways>** inputs are:

- Pathways enabled in the HRA
- Inhalation
- Soil and dermal exposure
- Human drinking water
- Homegrown produce
- Fish
- Fraction of diet from animal products
- Beef and dairy cow drinking water
- Beef and dairy cow diet
- Pig, chicken, and egg drinking water
- Pig diet
- Chicken diet
- Egg chicken diet



- Note: **Green numbers** are there to assist with following along. **Orange numbers** indicate text that is collapsed (+).

1. Pathways Enabled in HRA

The **<PathwaysEnabled>** text block shows a list of pathways that were used (**Y**) or not used (**N**) in the HRA. Because this HRA is inhalation only, **<Inhalation>** is the only pathway with a **Y**.

```
31 + <RiskScenario>
32 - <Pathways>
33   - <PathwaysEnabled>
34     <!--Y or N-->
35     <Inhalation>Y</Inhalation>
36     <Soil>N</Soil>
37     <Dermal>N</Dermal>
38     <MothersMilk>N</MothersMilk>
39     <Water>N</Water>
40     <Fish>N</Fish>
41     <HomegrownCrop>N</HomegrownCrop>
42     <Beef>N</Beef>
43     <Dairy>N</Dairy>
44     <Pig>N</Pig>
45     <Chicken>N</Chicken>
46     <Egg>N</Egg>
47   </PathwaysEnabled>
```

2. Inhalation

This section discusses pathway inputs for **<Inhalation>**.

<FAH3rdTrito16> and **<FAH16to70>** indicate whether or not a fraction of time spent at home (FAH) is applied to any of two age bins: third trimester to < 16 years or 16 to 70 years. FAH is applied if you wish to assume the individual spends only part of his or her day at home. In this case, it was applied to ages under 16 years.

<DBRType> is the daily breathing rate (DBR) activity, and determines how much pollution is breathed in over time. There are five kinds of breathing rates with varying intensities: *LongTerm24HR*, *RMP*, *SedentaryPassive8HR*, *Light8HR*, and *Moderate8HR*.

```
48 - <Inhalation>
49   <FAH3rdTrito16>Y</FAH3rdTrito16>
50   <!--Y or N-->
51   <FAH16to70>N</FAH16to70>
52   <!--Y or N-->
53   <DBRType>LongTerm24HR</DBRType>
```

Fraction of time
at home (FAH)
for two age bins

The **<GLCAjustmentFactor>** tag is the ground level concentration (GLC) adjustment factor. The GLC adjustment factor is a factor that can be applied to your GLCs to change the original concentration. By default the GLC is 1, as shown in the example. **<GLCAjustmentFactor>** is part of the **Use adjustment factors** box, which must be checked in the program in order to use the GLC adjustment feature. In this case, **<UseAdj>N</UseAdj>** displays **N** for no, because the **Use adjustment factors** box was not checked.

```
53 <DBRType>LongTerm24HR</DBRType>
54   <!--LongTerm24HR, RMP, SedentaryPassive8HR, Light8HR, or Moderate8HR-->
55 <GLCAjustmentFactor>1</GLCAjustmentFactor>
56 <UseAdj>N</UseAdj>
57   <!--Y or N-->
```


3. Soil and Dermal Exposure

Soil and dermal inputs account for pollutant transfer through soil and skin. These inputs are active when the soil or dermal pathway is selected. Because this was an inhalation-only assessment, the soil and dermal inputs are not active.

The `<Deposition>0.05</Deposition>` element contains the deposition rate at which the pollutant falls to the ground in meters per second. Here, it shows **0.05** m/s.

The `<SoilMixingRate>`, or soil mixing depth, specifies how deep the deposited pollutant mixes with soil in meters. By default the depth is **0.01** meters, as shown below.

The `<DermalClimate>` input is the climate-type. Here it is **Mixed**, indicating both warm and cold seasons. The weather types are *Cold, Mixed, or Warm*.

```
58 </Inhalation>
59 <Deposition>0.05</Deposition>
60 <SoilMixingRate>0.01</SoilMixingRate>
61 <DermalClimate>Mixed</DermalClimate>
62 <!--Cold, Mixed, or Warm-->
```



Soil and dermal inputs

4. Human Drinking Water

<HumanWater> inputs contain information needed to account for pollution exposure from drinking water. Human drinking water inputs are only active if you chose to evaluate this pathway.

<SurfaceArea> has the surface area in meters squared (m^2) of the contaminated body of water at the receptor point.

<WaterVolume> has the volume of the contaminated body of water in kilograms (kg).

<VolumeChangesPerYear> represents the number of emptying and filling cycles that body of water undergoes.

<FractionFromContamSource> refers to the fraction of the individual's total water intake that comes from the contaminated water at the receptor point.

```
63 - <HumanWater>
64   <SurfaceArea>0</SurfaceArea>
65   <!--m^2-->
66   <WaterVolume>0</WaterVolume>
67   <!--kg-->
68   <VolumeChangesPerYear>0</VolumeChangesPerYear>
69   <FractionFromContamSource>0</FractionFromContamSource>
```

<RecPhysicallyActiveLivesWorkHotClimates> is not used in the program and will remain 0.

```
70 <RecPhysicallyActiveLivesWorkHotClimates>N</RecPhysicallyActiveLivesWorkHotClimates>
71 <!--Y or N-->
```

5. Homegrown Produce

Following human drinking water inputs are the **<Homegrown>** inputs, for homegrown produce. Homegrown produce inputs are activated only if the **Homegrown Produce** pathway was selected in HARP 2.

The **<HouseholdType>** input specifies the receptor's produce-growing practices. For example, they may garden or farm.

The next inputs indicate what percentage of the receptor's diet from produce comes from contaminated crops, by crop type: **<Leafy>**, **<Exposed>**, **<Protected>**, and **<Root>** produce. In this HRA, the values show 13.7% (**0.137**) of the receptor's total leafy, exposed, protected, and root produce are impacted by pollutants.

```
72  </HumanWater>
73  - <Homegrown>
74    <HouseholdType>HouseholdsthatGarden</HouseholdType>
75    <!--HouseholdsthatGarden, HouseholdsthatFarm, or UserDefined-->
76    <Leafy>0.137</Leafy>
77    <Exposed>0.137</Exposed>
78    <Protected>0.137</Protected>
79    <Root>0.137</Root>
80  </Homegrown>
```

6. Fish

The **<Fish>** pathway accounts for human exposure to pollutants through consumption of contaminated fish. These inputs are active when the fish pathway is selected in HARP 2.

<SurfaceArea> is the surface area in meters squared (m^2) of the contaminated body of water used for fishing.

<WaterVolume> is the volume of the body of water in kilograms (kg).

<VolumeChangesPerYear> represents the number of emptying and filling cycles the body of water undergoes.

<FractionFromContamSource> refers to the fraction of the receptor's total fish intake that is impacted by pollutants at the receptor site.

```
81 - <Fish>
82   <SurfaceArea>0</SurfaceArea>
83   <!--m^2-->
84   <WaterVolume>0</WaterVolume>
85   <!--kg-->
86   <VolumeChangesPerYear>0</VolumeChangesPerYear>
87   <FractionFromContamSource>0</FractionFromContamSource>
88 </Fish>
```

7. Fraction of Diet from Animal Products

<AnimalFractions> are those inputs that describe how much of one's diet in animal products is contaminated by facility pollutants. These inputs are only active if the **Beef & Dairy** or **Pig, Chicken, & Egg** pathway was turned on in your HRA.

<HouseholdTypeBD> indicates whether a home hunts, raises, or farms cows that are living at the receptor point and are used for beef or dairy production.

<HouseholdTypePCE> indicates whether a home hunts, raises, or farms pigs or chickens that live at the receptor point and are used for meat or egg production.

<Beef>, **<Pork>**, **<Poultry>**, **<Eggs>**, and **<Dairy>** inputs contain the fraction of total beef, pork, poultry, egg, or dairy products a person eats that is contaminated by facility pollutants.

```
89 - <AnimalFractions>
90   <HouseholdTypeBD>RaiseHunt</HouseholdTypeBD>
91   <!--RaiseHunt, Farm, or UserDefined-->
92   <HouseholdTypePCE>RaiseHunt</HouseholdTypePCE>
93   <!--RaiseHunt, Farm, or UserDefined-->
94   <Beef>0.485</Beef>
95   <Pork>0.242</Pork>
96   <Poultry>0.156</Poultry>
97   <Eggs>0.146</Eggs>
98   <Dairy>0.207</Dairy>
99 </AnimalFractions>
```

8. Beef and Dairy Cow Drinking Water

<BeefDairyWater> inputs account for facility-contaminated water that beef and dairy cows living at the receptor might ingest. These inputs will be active if the **Beef & Dairy** pathway was selected.

<SurfaceArea> is the surface area in meters squared (m^2) of the contaminated body of drinking water for cows.

<WaterVolume> is the volume of that body of water in kilograms (kg).

<VolumeChangesPerYear> represents the number of emptying and filling cycles the body of water undergoes.

<FractionFromContamSourceBeef> refers to the fraction of the beef cow's total water intake that is polluted.

<FractionFromContamSourceDairy> refers to the fraction of the cow's total water intake that is polluted.

```
100 - <BeefDairyWater>
101   <SurfaceArea>0</SurfaceArea>
102   <!--m^2-->
103   <WaterVolume>0</WaterVolume>
104   <!--kg-->
105   <VolumeChangesPerYear>0</VolumeChangesPerYear>
106   <FractionFromContamSourceBeef>0</FractionFromContamSourceBeef>
107   <FractionFromContamSourceDairy>0</FractionFromContamSourceDairy>
108 </BeefDairyWater>
```

9. Beef and Dairy Cow Diet

<BeefFractionFromGrazing> and <DairyFractionFromGrazing> are the inputs that give the percentage of a beef or dairy cow's total diet that comes from grazing.

```
109 <BeefFractionFromGrazing>0</BeefFractionFromGrazing>  
110 <DairyFractionFromGrazing>0</DairyFractionFromGrazing>
```

10. Pig, Chicken, and Egg Drinking Water

If you selected the Pig, Chicken, & Egg pathway in your HRA, the <PigChickenEggsWater> inputs will be active. These inputs account for facility-contaminated water that chickens and pigs (raised for meat and egg products) drink.

<SurfaceArea> is the surface area in meters squared (m^2) of the contaminated body of drinking water for chickens and pigs.

<WaterVolume> is the volume of that body of water in kilograms (kg).

<VolumeChangesPerYear> represents the number of emptying and filling cycles that body of water undergoes.

<FractionFromContamSourcePig> refers to the fraction of the pig's total water intake that is polluted.

<FractionFromContamSourceChicken> refers to the fraction of the chicken's total water intake that is polluted.

<FractionFromContamSourceEggs> refers to the fraction of the egg-producing chicken's total water intake that is polluted.

```

111 <PigChickenEggsWater>
112   <SurfaceArea>0</SurfaceArea>
113   <!--m^2-->
114   <WaterVolume>0</WaterVolume>
115   <!--kg-->
116   <VolumeChangesPerYear>0</VolumeChangesPerYear>
117   <FractionFromContamSourcePig>0</FractionFromContamSourcePig>
118   <FractionFromContamSourceChicken>0</FractionFromContamSourceChicken>
119   <FractionFromContamSourceEggs>0</FractionFromContamSourceEggs>
120 </PigChickenEggsWater>

```

If you selected the Pig, Chicken, & Egg pathway in your assessment, the **<Pig>**, **<Chicken>**, and **<Egg>** inputs will be active. These inputs account for facility-contaminated food that chickens and pigs (raised for meat and egg products) eat. Inputs incorporate diet from onsite feed, vegetation, and eating off the ground.

<FractionEatenOffGround> is a feature not used in the module and will be 0.

<FractionFeedOnsiteContaminated> represents the percentage of the animal's diet from feed produced onsite that is contaminated from facility pollutants.

<Leafy> refers to the fraction of the animal's total leafy crop intake that is polluted.

<Exposed> refers to the fraction of the animal's total exposed crop intake that is polluted.

<Protected> refers to the fraction of the animal's total protected crop intake that is polluted.

<Root> refers to the fraction of the animal's total root crop intake that is polluted.


```

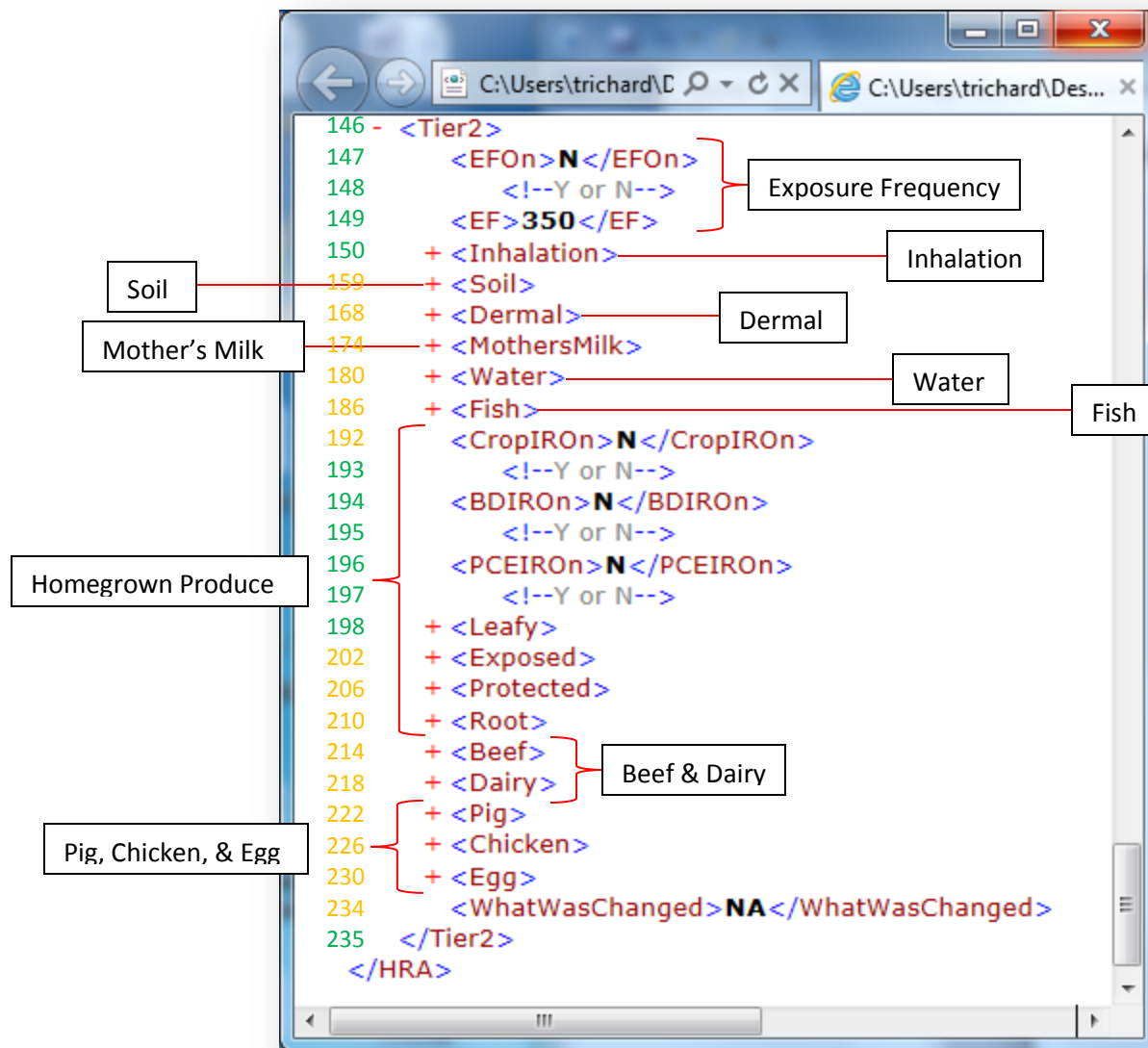
121 - <Pig>
122     <FractionEatenOffGround>0</FractionEatenOffGround>
123     <FractionFeedOnsiteContaminated>0</FractionFeedOnsiteContaminated>
124     <Leafy>0</Leafy>
125     <Exposed>0</Exposed>
126     <Protected>0</Protected>
127     <Root>0</Root>
128 </Pig>
129 - <Chicken>
130     <FractionEatenOffGround>0</FractionEatenOffGround>
131     <FractionFeedOnsiteContaminated>0</FractionFeedOnsiteContaminated>
132     <Leafy>0</Leafy>
133     <Exposed>0</Exposed>
134     <Protected>0</Protected>
135     <Root>0</Root>
136 </Chicken>
137 - <Egg>
138     <FractionEatenOffGround>0</FractionEatenOffGround>
139     <FractionFeedOnsiteContaminated>0</FractionFeedOnsiteContaminated>
140     <Leafy>0</Leafy>
141     <Exposed>0</Exposed>
142     <Protected>0</Protected>
143     <Root>0</Root>
144 </Egg>
145 </Pathways>

```

F. Tier 2 Inputs

Tier 2 inputs use point estimates defined by the user. Tier 2 inputs include those for:

- Exposure Frequency
- Inhalation
- Soil
- Dermal
- Mother's Milk
- Water
- Fish
- Homegrown Produce: Leafy, Exposed, Protected, Root
- Beef & Dairy
- Pig, Chicken, & Egg



Green numbers on the left are there to assist you with following along. **Orange** indicates number skipping.

1. Exposure Frequency

For worker and 8-hour assessments, **<EFO n>** indicates whether or not the exposure frequency was adjusted (**Y** or **N**) for noninhalation pathways.

<EF> is the exposure frequency in days per year that a subject is exposed to facility pollutants. In this example it is **350** days per year.

```
146 - <Tier2>  
147   <EFO n>N</EFO n>  
148     <!--Y or N-->  
149   <EF>350</EF>
```

2. Inhalation

<IRO n> indicates whether the option to submit user-defined Tier 2 breathing rates was used.

<Mean> inputs are the breathing rates used, by age group, that correspond to a 65th percentile exposure rate to pollutants. Numbers are expressed in L/kg-day.

<HighEnd> inputs are the breathing rates used, by age group, that correspond to a 95th percentile exposure rate to pollutants. Numbers are expressed in L/kg-day.

<FAHO n> indicates whether the option to submit user-defined fractions of time spent at home was used.

<FAH> indicates the fractions used for time at home by age group. For example, this HRA assumes that infants, zero to two years spend 85% (**0.85**) of their time at home.

```

150 - <Inhalation>
151     <IROn>N</IROn>
152     <!--Y or N-->
153     <Mean>225,658,535,452,210,185</Mean>
154     <HighEnd>361,1090,861,745,335,290</HighEnd>
155     <FAHOn>N</FAHOn>
156     <!--Y or N-->
157     <FAH>0.85,0.85,0.72,0.72,0.73,0.73</FAH>
158 </Inhalation>

```

3. Soil

<Soil> inputs account for air pollutants deposited into soil that are later introduced to humans by soil ingestion, and crop and animal accumulation. Soil inputs will be active if you selected them in HARP 2.

<IROn> indicates whether the option to submit user-defined Tier 2 soil ingestion rates was used.

<Mean> inputs are the soil ingestion rates used, by age group, which correspond to a 65th percentile exposure rate to pollutants. Numbers are expressed in mg/kg-day.

<HighEnd> inputs are the soil ingestion rates used, by age group, which correspond to a 95th percentile exposure rate to pollutants. Numbers are expressed in mg/kg-day.

<TfOn> indicates whether or not (Y or N) the Tier 2 option was checked to change the number of days pollutants accumulated in soil.

<Tf> is the Tier 2 option to change how many days the pollutants accumulated in soil. The default is **25550** days, or 70 years.

```

159 - <Soil>
160     <IROn>N</IROn>
161     <!--Y or N-->
162     <Mean>0.7,20,5,3,0.7,0.6</Mean>
163     <HighEnd>3,40,20,10,3,3</HighEnd>
164     <TfOn>N</TfOn>
165     <!--Y or N-->
166     <Tf>25550</Tf>
167 </Soil>

```

4. Dermal

<Dermal> inputs account for pollutants absorbed through skin from exposure to contaminated soil.

<TfOn> indicates whether or not (**Y** or **N**) the Tier 2 option was checked to change the dermal loading rate of pollutants from soil in mg/kg-yr.

<Mean> inputs are the dermal loading rates used, by age group, which correspond to a 65th percentile exposure rate to pollutants. Numbers are expressed in mg/kg-yr.

<HighEnd> inputs are the dermal loading rates used, by age group, which correspond to a 95th percentile exposure rate to pollutants. Numbers are expressed in mg/kg-yr.

```

168 - <Dermal>
169     <TfOn>N</TfOn>
170     <!--Y or N-->
171     <Mean>1100,2200,6600,5700,1100,1100</Mean>
172     <HighEnd>2400,2900,8700,8100,2400,2400</HighEnd>
173 </Dermal>

```

5. Mother's Milk

<MothersMilk> inputs account for facility pollutants transferred from mother to infant through breast milk. Inputs are activated if you selected the mother's milk pathway in HARP 2.

<TfOn> indicates whether or not (**Y** or **N**) the Tier 2 option was checked to change the default ingestion rate of breast milk in g/kg-day.

<Mean> inputs are the milk intake rate used, for an infant's first year of feeding, which corresponds to a 65th percentile exposure rate to pollutants. Numbers are expressed in g/kg-day.

<HighEnd> inputs are the milk intake rate used, for an infant's first year of feeding, which correspond to a 95th percentile exposure rate to pollutants. Numbers are expressed in g/kg-day.

```

174 - <MothersMilk>
175     <TfOn>N</TfOn>
176     <!--Y or N-->
177     <Mean>101</Mean>
178     <HighEnd>139</HighEnd>
179 </MothersMilk>

```

6. Water

Drinking **<Water>** inputs account for pollutants ingested by humans from drinking water contaminated with facility pollutants.

<TfOn> indicates whether or not (**Y** or **N**) the Tier 2 option was checked to change the default human consumption rates of drinking water in ml/kg-day.

<Mean> inputs are the water consumption rates used, by age group, which correspond to a 65th percentile exposure rate to pollutants. Numbers are expressed in ml/kg-day.

<HighEnd> inputs are the water consumption rates used, by age group, which correspond to a 95th percentile exposure rate to pollutants. Numbers are expressed in ml/kg-day.

```
180 - <Water>
181     <TfOn>N</TfOn>
182     <!--Y or N-->
183     <Mean>18,113,26,24,18,18</Mean>
184     <HighEnd>47,196,66,61,47,45</HighEnd>
185 </Water>
```


7. Fish

<Fish> inputs account for pollutants ingested by eating contaminated fish. Tier 2 is available if you chose to assess the fish pathway in your assessment.

<TfOn> indicates whether or not (**Y** or **N**) the Tier 2 option was checked to change the default human fish consumption rates in g/kg-day.

<Mean> inputs are the fish consumption rates used, by age group, which correspond to a 65th percentile exposure rate to pollutants. Numbers are expressed in g/kg-day.

<HighEnd> inputs are the fish consumption rates used, by age group, which correspond to a 95th percentile exposure rate to pollutants. Numbers are expressed in g/kg-day.

```
186 - <Fish>
187     <TfOn>N</TfOn>
188     <!--Y or N-->
189     <Mean>0.38,0.18,0.36,0.36,0.38,0.36</Mean>
190     <HighEnd>1.22,0.58,1.16,1.16,1.22,1.16</HighEnd>
191 </Fish>
```

8. Homegrown Produce

Tier 2 homegrown produce inputs include options for user-defined crop intake rates from leafy, exposed, protected, and root vegetation. **<BDIRON>** and **<PCEIRON>** are inputs for the beef & dairy pathway, and pig, chicken, & egg pathway, respectively.

<CropIRON> indicates whether or not (**Y** or **N**) the box was checked to activate user-defined human consumption rates for various crop types in g/kg-day.

<Mean> includes crop consumption rates used, by age group, which correspond to a 65th percentile exposure rate to pollutants. Numbers are expressed in g/kg-day. Mean intake rates are categorized by **<Leafy>**, **<Exposed>**, **<Protected>**, and **<Root>** crops.

<HighEnd> includes crop consumption rates used, by age group, which correspond to a 95th percentile exposure rate to pollutants. Numbers are expressed in g/kg-day. Mean intake rates are categorized by **<Leafy>**, **<Exposed>**, **<Protected>**, and **<Root>** crops.

```

192     <CropIRON>N</CropIRON>
193     <!--Y or N-->
194     <BDIRON>N</BDIRON>
195     <!--Y or N-->
196     <PCEIRON>N</PCEIRON>
197     <!--Y or N-->
198 - <Leafy>
199     <Mean>0.9,3.8,2.5,0.9,0.9,1.1</Mean>
200     <HighEnd>3.2,10.8,7.9,3.2,3.2,3.4</HighEnd>
201 </Leafy>
202 - <Exposed>
203     <Mean>1.9,11.7,7.4,1.9,1.9,1.8</Mean>
204     <HighEnd>5.9,30.2,21.7,5.9,5.9,5.6</HighEnd>
205 </Exposed>
206 - <Protected>
207     <Mean>1.7,5.9,4.7,1.7,1.7,1.6</Mean>
208     <HighEnd>5.8,17.5,13.3,5.8,5.8,5.2</HighEnd>
209 </Protected>
210 - <Root>
211     <Mean>1.7,5.7,3.9,1.7,1.7,1.5</Mean>
212     <HighEnd>4.6,15.3,10.8,4.6,4.6,4.2</HighEnd>
213 </Root>

```

9. Beef & Dairy and Pig, Chicken, & Egg

These inputs account for pollutants ingested by humans from contaminated beef, dairy, pig, chicken, and egg products.

```
214 - <Beef>
215     <Mean>2,3.9,3.5,2,2,1.7</Mean>
216     <HighEnd>4.8,11.3,8.6,4.8,4.8,4.4</HighEnd>
217 </Beef>
218 - <Dairy>
219     <Mean>5.4,50.9,23.3,5.4,5.4,4.3</Mean>
220     <HighEnd>15.9,116,61.4,15.9,15.9,13.2</HighEnd>
221 </Dairy>
222 - <Pig>
223     <Mean>1.8,4.5,3.7,1.8,1.8,1.5</Mean>
224     <HighEnd>4.7,11.4,9,4.7,4.7,3.8</HighEnd>
225 </Pig>
226 - <Chicken>
227     <Mean>0.9,2.9,2.2,0.9,0.9,0.9</Mean>
228     <HighEnd>2.9,10.5,7.8,2.9,2.9,2.8</HighEnd>
229 </Chicken>
230 - <Egg>
231     <Mean>1.6,6.1,3.9,1.6,1.6,1.3</Mean>
232     <HighEnd>4.2,15,9.4,4.2,4.2,3.4</HighEnd>
233 </Egg>
234     <WhatWasChanged>NA</WhatWasChanged>
235 </Tier2>
236 </HRA>
```

<Mean> inputs include **<Beef>**, **<Dairy>**, **<Pig>**, **<Chicken>**, and **<Egg>** human consumption rates used, by age group, which correspond to a 65th percentile exposure rate to pollutants. Numbers are expressed in g/kg-day.

<HighEnd> inputs include **<Beef>**, **<Dairy>**, **<Pig>**, **<Chicken>**, and **<Egg>** human consumption rates used, by age group, which correspond to a 95th percentile exposure rate to pollutants. Numbers are expressed in g/kg-day.

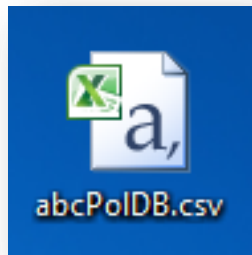
<BDIROn> (line 194) and **<PCEIROn>** (line 196) indicate whether these Tier 2 inputs for the beef & dairy pathway, and the pig, chicken, & egg pathway were activated.

3. PoIDB.csv File

PoIDB.csv is the input file exported by HARP 2 that contains a database of health information for the pollutants used in your HRA. The PoIDB.csv file includes cancer potency values and whether or not a pollutant is multipathway. **abcPoIDB.csv** will be used as an example.

A. Opening and Viewing Content

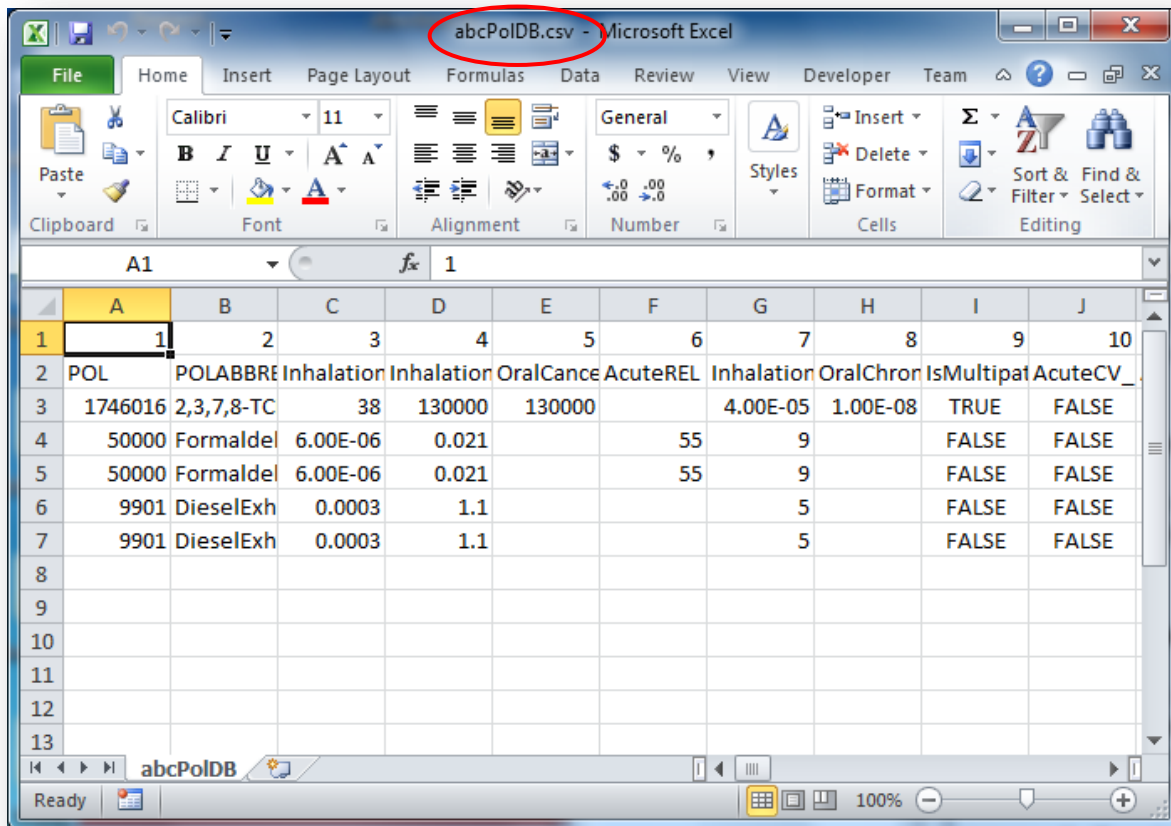
Find and double-click the PoIDB.csv file icon to open it.



The filename will begin with the prefix you designated in the **Calculate Risk** screen. In this example it is **abc**.

B. Understanding File Content

PolDB.csv can be opened in a spreadsheet and will look like the image below. The file contents will be explained in groups of columns, outlined in Table 3-1.



	A	B	C	D	E	F	G	H	I	J
1	1	2	3	4	5	6	7	8	9	10
2	POL	POLABBRE	Inhalation	Inhalation	OralCance	AcuteREL	Inhalation	OralChron	IsMultipat	AcuteCV
3	1746016	2,3,7,8-TC	38	130000	130000		4.00E-05	1.00E-08	TRUE	FALSE
4	50000	Formaldehyde	6.00E-06	0.021		55	9		FALSE	FALSE
5	50000	Formaldehyde	6.00E-06	0.021		55	9		FALSE	FALSE
6	9901	DieselExh	0.0003	1.1			5		FALSE	FALSE
7	9901	DieselExh	0.0003	1.1			5		FALSE	FALSE
8										
9										
10										
11										
12										
13										

Table 3-1. Column Groups in PolDB File

Group	Purpose	Columns
Pollutant identification	Identifies and names pollutant.	POL, POLABBREV
Cancer risk factors and RELs by inhalation	Supplies cancer potency and reference exposure levels for inhalation exposure.	InhalationCancerURF, InhalationCancerSlopeFactor, OralCancerSlopeFactor, AcuteREL, InhalationChronicREL, OralChronicREL
Is pollutant multipathway	Indicates if the pollutant has exposure pathways other than inhalation.	IsMultipathway
Risk to target organs by acute exposure	Supplies noncancer health risk values related to acute exposure for that pollutant.	AcuteCV, AcuteCNS, AcuteIMMUN, AcuteKIDNEY, AcuteGILV, AcuteREPRO_DEVEL, AcuteRESP, AcuteSKIN, AcuteEYE, AcuteBONE_TEETH, AcuteENDO, AcuteBLOOD, AcuteODOR, AcuteGENERAL
Risk to target organs by chronic inhalation exposure	Supplies noncancer health risk data related to chronic inhalation exposure for that pollutant.	InhalationChronicCV, InhalationChronicCNS, InhalationChronicIMMUN, InhalationChronicKIDNEY, InhalationChronicGILV, InhalationChronicREPRO_DEVEL, InhalationChronicRESP, InhalationChronicSKIN, InhalationChronicEYE, InhalationChronicBONE_TEETH, InhalationChronicENDO, InhalationChronicBLOOD, InhalationChronicODOR, InhalationChronicGENERAL
Risk to target organs by chronic oral exposure	Supplies noncancer health risk data related to chronic oral exposure to that pollutant.	OralChronicCV, OralChronicCNS, OralChronicIMMUN, OralChronicKIDNEY, OralChronicGILV, OralChronicREPRO_DEVEL, OralChronicRESP, OralChronicSKIN, OralChronicEYE, OralChronicBONE_TEETH, OralChronicENDO, OralChronicBLOOD, OralChronicODOR, OralChronicGENERAL

Table 3-1. Column Groups in PoIDB File (cont)

Group	Purpose	Columns
Pathways of exposure	Indicates through which pathways a human may be exposed to that pollutant.	PathwayInhalation, PathwayDrinking, PathwayFood, PathwayCrop, PathwayExposed, PathwayLeafy, PathwayProtected, PathwayRoot, PathwayDairy, PathwayMeatEggs, PathwaySoilIngestion, PathwayFish, PathwayDermal, PathwayMothersMilk
Uptake from soil by vegetation	Supplies values for crop accumulation of the pollutant.	SoilUptakeFactorLeafy, SoilUptakeFactorExposed, SoilUptakeFactorProtected, SoilUptakeFactorRoot
Pollutant to animal food product transfer coefficients	Supplies values for animal bioaccumulation of the pollutant.	FoodTcoMilk, FoodTcoEgg, FoodTcoChicken, FoodTcoBeef, FoodTcoPig, FishBCF
Absorption factors and molecular weight correction	Supplies values to correct for absorption and molecular weight of the pollutant.	HalfLifeInSoil, GRAF, MolWtCorrection, DermalAbsorptionFactor
Risk to target organs by chronic 8-hour inhalation exposure	Supplies noncancer health risk data related to chronic 8-hour inhalation of that pollutant.	InhalationChronicREL_8HR, InhalationChronicCV_8HR, InhalationChronicCNS_8HR, InhalationChronicIMMUN_8HR, InhalationChronicKIDNEY_8HR, InhalationChronicGILV_8HR, InhalationChronicREPRO_DEVEL_8HR, InhalationChronicRESP_8HR, InhalationChronicSKIN_8HR, AcuteEYE_8HR, InhalationChronicBONE_TEETH_8HR, InhalationChronicENDO_8HR, InhalationChronicBLOOD_8HR, InhalationChronicODOR_8HR, InhalationChronicGENERAL_8HR
Pollutant to mother's milk transfer coefficients	Indicates transfer rate of pollutant from mother to breast milk and infant.	Tco_InhMM, Tco_OralMM
Chemical group	Name the chemical group of pollutant.	RChem_Group_HV

1. Pollutant Identification

	A	B	C	D
1	1	2	3	4
2	POL	POLABBREV	InhalationCancerURF	InhalationCancerSlopeFactor
3	1746016	2,3,7,8-TCDD	38	130000
4	50000	Formaldehyde	6.00E-06	0.021
5	50000	Formaldehyde	6.00E-06	0.021
6	9901	DieselExhPM	0.0003	1.1
7	9901	DieselExhPM	0.0003	1.1
8				

Column Name	Column Number	Description
POL	1	Pollutant number.
POLABBREV	2	Pollutant abbreviation.

Pollutant identification columns give the name and POLID/CAS number for the pollutant in that row. For example, **Formaldehyde** (rows four and five) has a pollutant number of **50000**. **2,3,7,8-Tetrachlorodibenzodioxin (2,3,7,8-TCDD)** has a pollutant identification number of **1746016**.

2. Cancer Risk Factors and RELs by Inhalation

	C	D	E
1	3	4	5
2	InhalationCancerURF	InhalationCancerSlopeFactor	OralCancerSlopeFactor
3	38	130000	130000
4	6.00E-06	0.021	
5	6.00E-06	0.021	
6	0.0003	1.1	
7	0.0003	1.1	
8			

Column Name	Column Number	Description
InhalationCancerURF	3	Cancer inhalation unit risk factor (ug/m ³) ⁻¹ .
InhalationCancerSlopeFactor	4	Cancer inhalation slope factor (mg/kg/d) ⁻¹ .
OralCancerSlopeFactor	5	Oral cancer slope factor (mg/kg/d) ⁻¹ .

Formaldehyde (rows four and five) has a cancer inhalation unit risk factor of $0.000006(\text{ug}/\text{m}^3)^{-1}$, with no oral cancer slope factor. When a pollutant has no oral cancer slope factor, it is not considered a cancer multipathway pollutant. In contrast, **2,3,7,8-TCDD** (row three) has an oral cancer slope factor of $130,000(\text{mg}/\text{kg}/\text{d})^{-1}$ which means exposure may be evaluated for other pathways in cancer HRAs.

	F	G	H
1	6	7	8
2	AcuteREL	InhalationChronicREL	OralChronicREL
3		4.00E-05	1.00E-08
4	55	9	9
5	55	9	5
6		5	5
7		5	5
8			

Column Name	Column Number	Description
AcuteREL	6	Non-cancer inhalation acute reference exposure level ug/m ³ .
InhalationChronicREL	7	Non-cancer inhalation chronic reference exposure level ug/m ³ .
OralChronicREL	8	Non-cancer multipath oral dose reference exposure level ug/m ³ .

In this example, **Formaldehyde** (rows four and five) has an acute reference exposure level of **55ug/m³**, with no oral chronic slope factor. When a pollutant has no oral chronic slope factor, it means that it is not considered a chronic multipathway pollutant and is evaluated for inhalation only in chronic assessments. **2,3,7,8-TCDD**, on the other hand, does have an oral chronic slope factor at **0.00000001ug/m³** which means exposure may be evaluated for multipathway in chronic HRAs.

3. Is Pollutant Multipathway

	H	I	J
1	8	9	
2	OralChronicREL	IsMultipathway	AcuteCV_
3	1.00E-08	TRUE	FALSE
4		FALSE	FALSE
5		FALSE	FALSE
6		FALSE	FALSE
7		FALSE	FALSE
8			

Column Name	Column Number	Description
IsMultipathway	9	True if this is a multipathway chemical.

As we determined from the absence of a chronic oral REL and cancer oral slope factor, **Formaldehyde** is not a multipathway (**FALSE**) pollutant, meaning cancer and chronic health effects are not assessed for pathways other than inhalation. The pollutant **2,3,7,8-TCDD**, however, states **TRUE** because it has an oral health risk value.

4. Risk to Target Organs by Acute Exposure

	J	K	L	M	N	O
1	10	11	12	13	14	15
2	AcuteCV_	AcuteCNS_	AcuteIMMUN_	AcuteKIDNEY_	AcuteGILV_	AcuteREPRO_DEVEL_
3	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
4	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
8						

Column Name	Column Number	Description
AcuteCV	10	Flag indicating whether this chemical has an acute effect on the cardiovascular system.
AcuteCNS	11	Flag indicating whether this chemical has an acute effect on the central nervous system.
AcuteIMMUN	12	Flag indicating whether this chemical has an acute effect on the immune system.
AcuteKIDNEY	13	Flag indicating whether this chemical has an acute effect on the kidney organ system.
AcuteGILV	14	Flag indicating whether this chemical has an acute effect on the gastrointestinal and liver organ systems.
AcuteREPRO_DEVEL	15	Flag indicating whether this chemical has an acute effect on reproductive and developmental organ systems.

	P	Q	R	S	T
1	16	17	18	19	20
2	AcuteRESP_	AcuteSKIN_	AcuteEYE_	AcuteBONE_TEETH_	AcuteENDO_
3	FALSE	FALSE	FALSE	FALSE	FALSE
4	FALSE	FALSE	TRUE	FALSE	FALSE
5	FALSE	FALSE	TRUE	FALSE	FALSE
6	FALSE	FALSE	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE	FALSE	FALSE
8					

Column Name	Column Number	Description
AcuteRESP	16	Flag indicating whether this chemical has acute effect on the respiratory system.
AcuteSKIN	17	Flag indicating whether this chemical has acute effect on skin.
AcuteEYE	18	Flag indicating whether this chemical has acute effect on eyes.
AcuteBONE_ TEETH	19	Flag indicating whether this chemical has acute effect on the skeletal system.
AcuteENDO	20	Flag indicating whether this chemical has acute effect on the endocrine system.

	U	V	W
1	21	22	23
2	AcuteBLOOD_	AcuteODOR_	AcuteGENERAL
3	FALSE	FALSE	FALSE
4	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE
8			

Column Name	Column Number	Description
AcuteBLOOD	21	Flag indicating whether this chemical has acute effect on the hematological system.
AcuteODOR	22	Flag indicating whether this chemical has acute effect on physiological response to odors.
AcuteGENERAL	23	Flag indicating whether this chemical has acute effect of general toxicity.

5. Risk to Target Organs by Chronic Inhalation Exposure

The screenshot shows a Microsoft Excel window titled 'abcPolDB.csv - Microsoft Excel'. The 'Home' tab is active, showing the ribbon with Font, Alignment, Number, Styles, Cells, and Editing groups. The worksheet contains a table with columns X, Y, Z, and AA. The data is as follows:

	X	Y	Z	AA
1	24	25	26	27
2	InhalationChronicCV_	InhalationChronicCNS_	InhalationChronicIMMUN_	InhalationChronicKIDNEY
3	FALSE	FALSE	FALSE	FALSE
4	FALSE	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE	FALSE

Column Name	Column Number	Description
InhalationChronic CV	24	Flag indicating whether this chemical has a chronic effect on the cardiovascular system through the inhalation pathway.
InhalationChronic CNS	25	Flag indicating whether this chemical has a chronic effect on the central nervous system through the inhalation pathway.
InhalationChronic IMMUN	26	Flag indicating whether this chemical has a chronic effect on the immune system through the inhalation pathway.
InhalationChronic KIDNEY	27	Flag indicating whether this chemical has a chronic effect on the kidney organ system through the inhalation pathway.

	AB	AC	AD	AE
1				
2	28	29	30	31
3	InhalationChronicGILV_	InhalationChronicREPRO_DEVEL_	InhalationChronicRESP_	InhalationChronicSKIN_
4	TRUE	TRUE	TRUE	FALSE
5	FALSE	FALSE	TRUE	FALSE
6	FALSE	FALSE	TRUE	FALSE
7	FALSE	FALSE	TRUE	FALSE

Column Name	Column Number	Description
InhalationChronic GILV	28	Flag indicating whether this chemical has a chronic effect on the gastrointestinal and liver systems through the inhalation pathway.
InhalationChronic REPRO_DEVEL	29	Flag indicating whether this chemical has a chronic effect on reproductive and developmental systems through the inhalation pathway.
InhalationChronic RESP	30	Flag indicating whether this chemical has a chronic effect on the respiratory system through the inhalation pathway.
InhalationChronic SKIN	31	Flag indicating whether this chemical has a chronic effect on skin through the inhalation pathway.

	AF	AG	AH	AI
1	32	33	34	35
2	InhalationChronicEYE_	InhalationChronicBONE_TEETH_	InhalationChronicENDO_	InhalationChronicBLOOD_
3	FALSE	FALSE	TRUE	TRUE
4	FALSE	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE	FALSE

Column Name	Column Number	Description
InhalationChronic EYE	32	Flag indicating whether this chemical has a chronic effect on the eyes through the inhalation pathway.
InhalationChronic BONE_TEETH	33	Flag indicating whether this chemical has a chronic effect on the skeletal system through the inhalation pathway.
InhalationChronic ENDO	34	Flag indicating whether this chemical has a chronic effect on the endocrine system through the inhalation pathway.
InhalationChronic BLOOD	35	Flag indicating whether this chemical has a chronic effect on hematological system through the inhalation pathway.

	AJ	AK
1	36	37
	InhalationChronicODOR_	InhalationChronicGENERAL_
3	FALSE	FALSE
4	FALSE	FALSE
5	FALSE	FALSE
6	FALSE	FALSE
7	FALSE	FALSE

Column Name	Column Number	Description
InhalationChronic ODOR	36	Flag indicating whether this chemical has a chronic effect on the physiological response to odors through the inhalation pathway.
InhalationChronic GENERAL	37	Flag indicating whether this chemical has a chronic effect of general toxicity through the inhalation pathway.

6. Risk to Target Organs by Chronic Oral Exposure

The screenshot shows an Excel spreadsheet titled 'abcPolDB.csv'. The data is organized into columns labeled AL, AM, AN, and AO. Row 1 contains column numbers 38, 39, 40, and 41. Row 2 contains the column headers: OralChronicCV_, OralChronicCNS_, OralChronicIMMUN_, and OralChronicKIDNEY_. Rows 3 through 7 show 'FALSE' for all four columns. Row 8 is currently selected.

	AL	AM	AN	AO
1	38	39	40	41
2	OralChronicCV_	OralChronicCNS_	OralChronicIMMUN_	OralChronicKIDNEY_
3	FALSE	FALSE	FALSE	FALSE
4	FALSE	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE	FALSE
8				

Column Name	Column Number	Description
OralChronicCV	38	Flag indicating whether this chemical has a chronic effect on the cardiovascular system through the oral pathway.
OralChronicCNS	39	Flag indicating whether this chemical has a chronic effect on the central nervous system through the oral pathway.
OralChronicIMMUN	40	Flag indicating whether this chemical has a chronic effect on the immune system through the oral pathway.
OralChronicKIDNEY	41	Flag indicating whether this chemical has a chronic effect on kidney organ system through the oral pathway.

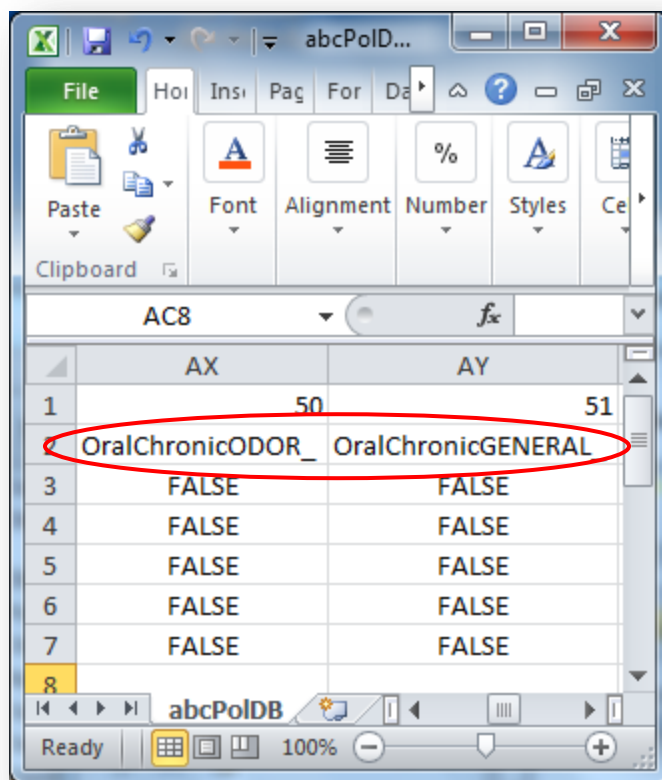
The screenshot shows an Excel spreadsheet titled 'abcPolDB.csv'. The table has columns labeled AP, AQ, AR, and AS. The data is as follows:

	AP	AQ	AR	AS
1	42	43	44	45
2	OralChronicGILV_	OralChronicREPRO_DEVEL_	OralChronicRESP_	OralChronicSKIN_
3	TRUE	TRUE	TRUE	FALSE
4	FALSE	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE	FALSE
8				

Column Name	Column Number	Description
OralChronicGILV	42	Flag indicating whether this chemical has a chronic effect on the gastrointestinal system and liver through the oral pathway.
OralChronicREPRO_DEVEL	43	Flag indicating whether this chemical has a chronic effect on the reproductive and central nervous systems through the oral pathway.
OralChronicRESP	44	Flag indicating whether this chemical has a chronic effect on the respiratory system through the oral pathway.
OralChronicSKIN	45	Flag indicating whether this chemical has a chronic effect on skin through the oral pathway.

	AT	AU	AV	AW
1	46	47	48	49
2	OralChronicEYE_	OralChronicBONE_TEETH_	OralChronicENDO_	OralChronicBLOOD_
3	FALSE	FALSE	TRUE	TRUE
4	FALSE	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE	FALSE
8				

Column Name	Column Number	Description
OralChronicEYE	46	Flag indicating whether this chemical has a chronic effect on the eyes through the oral pathway.
OralChronicBONE_ TEETH	47	Flag indicating whether this chemical has a chronic effect on the skeletal system through the oral pathway.
OralChronicENDO	48	Flag indicating whether this chemical has a chronic effect on the endocrine system through the oral pathway.
OralChronicBLOOD	49	Flag indicating whether this chemical has a chronic effect on the hematological system through the oral pathway.



Column Name	Column Number	Description
OralChronicODOR	50	Flag indicating whether this chemical has a chronic effect on the physiological response to odors through the oral pathway.
OralChronicGENERAL	51	Flag indicating whether this chemical has a chronic effect of general toxicity through the oral pathway.

7. Pathways of Exposure

The screenshot shows an Excel spreadsheet titled 'abcPolDB.csv'. The table has 5 columns and 7 rows. The first row (row 2) is highlighted with a red oval. The data in the first row is as follows:

	52	53	54	55	56
PathwayInhalation	PathwayDrinking	PathwayFood	PathwayCrop	PathwayExposed	
3	TRUE	TRUE	TRUE	TRUE	TRUE
4	TRUE	FALSE	FALSE	FALSE	FALSE
5	TRUE	FALSE	FALSE	FALSE	FALSE
6	TRUE	FALSE	FALSE	FALSE	FALSE
7	TRUE	FALSE	FALSE	FALSE	FALSE

Column Name	Column Number	Description
PathwayInhalation	52	Flag indicating whether this chemical can follow the inhalation pathway.
PathwayDrinking	53	Flag indicating whether this chemical can follow the drinking pathway.
PathwayFood	54	Flag indicating whether this chemical can follow the food pathway.
PathwayCrop	55	Flag indicating whether this chemical can follow the crop pathway.
PathwayExposed	56	Flag indicating whether this chemical can follow the exposed crop pathway.

	BE	BF	BG	BH	BI
1	57	58	59	60	61
2	PathwayLeafy	PathwayProtected	PathwayRoot	PathwayDairy	PathwayMeatEggs
3	TRUE	FALSE	FALSE	TRUE	TRUE
4	FALSE	FALSE	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE	FALSE	FALSE

Column Name	Column Number	Description
PathwayLeafy	57	Flag indicating whether this chemical can follow the leafy crop pathway.
PathwayProtected	58	Flag indicating whether this chemical can follow the protected crop pathway.
PathwayRoot	59	Flag indicating whether this chemical can follow the root crop pathway.
PathwayDairy	60	Flag indicating whether this chemical can follow the dairy pathway.
PathwayMeatEggs	61	Flag indicating whether this chemical can follow the meat and egg pathways.

The screenshot shows an Excel spreadsheet titled 'abcPolDB.csv'. The active sheet is 'abcPolDB'. The table structure is as follows:

	BJ	BK	BL	BM
1	62	63	64	65
2	PathwaySoilIngestion	PathwayFish	PathwayDermal	PathwayMothersMilk
3	TRUE	TRUE	TRUE	TRUE
4	FALSE	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE	FALSE

Column Name	Column Number	Description
PathwaySoilIngestion	62	Flag indicating whether this chemical can follow the soil ingestion pathway.
PathwayFish	63	Flag indicating whether this chemical can follow the fish pathway.
PathwayDermal	64	Flag indicating whether this chemical can follow the dermal pathway.
PathwayMothersMilk	65	Flag indicating whether this chemical can follow the mother's milk pathway.

8. Uptake from Soil by Vegetation

	BN	BO	BP	BQ
1	66	67	68	69
2	SoilUptakeFactorLeaf	SoilUptakeFactorExp	SoilUptakeFactorProt	SoilUptakeFactorRoot
3				
4				
5				
6				
7				

Column Name	Column Number	Description
SoilUptakeFactor Leafy	66	Soil uptake factor of pollutant for leafy plants.
SoilUptakeFactor Exposed	67	Soil uptake factor of pollutant for exposed plants.
SoilUptakeFactor Protected	68	Soil uptake factor of pollutant for protected plants.
SoilUptakeFactor Root	69	Soil uptake factor of pollutant for root plants.

Soil uptake factors account for pollutants that are absorbed by various crop types at a certain rate.

9. Pollutant to Animal Food Product Transfer Coefficients

	BR	BS	BT	BU	BV
1	70	71	72	73	74
2	FoodTcoMilk	FoodTcoEgg	FoodTcoChicken	FoodTcoBeef	FoodTcoPig
3	0.02	10	9	0.7	0.1
4					
5					
6					
7					

Column Name	Column Number	Description
FoodTcoMilk	70	Milk uptake factor of pollutant from feed.
FoodTcoEgg	71	Egg uptake factor of pollutant from feed.
FoodTcoChicken	72	Chicken uptake factor of pollutant from feed.
FoodTcoBeef	73	Beef uptake factor of pollutant from feed.
FoodTcoPig	74	Pig uptake factor of pollutant from feed.

Because **2,3,7,8-TCDD** (row three) is a multipathway pollutant and is absorbed by animals from feeding, its transfer to animals and animal food products may be calculated using transfer coefficients (**Tco**). For example, **2,3,7,8-TCDD** has a Tco to chicken eggs of **10**, and a Tco to chicken meat of **9**.

10. Absorption Factors and Molecular Weight Correction

	BW	BX	BY	BZ	CA
1	75	76	77	78	79
2	HalfLifeInSoil	GRAF	FishBCF	MolWtCorrection	DermalAbsorptionFactor
3	7000	0.43	300000	1	0.03
4				1	
5				1	
6				1	
7				1	

Column Name	Column Number	Description
HalfLifeInSoil	75	Pollutant half-life in soil (days).
GRAF	76	Gastrointestinal relative absorption factor.
FishBCF	77	Fish bioconcentration factor.
MolWtCorrection	78	Molecular weight adjustment factor (MWAf); multiplies risk for pollutant.
DermalAbsorption Factor	79	Dermal absorption factor.

The term **GRAF**, or gastrointestinal (GI) relative absorption factor, is defined as the fraction of contaminant absorbed by the GI tract relative to the fraction of contaminant absorbed from the matrix (feed, water, other). GRAF allows for adjustment for absorption from a soil matrix if it is known to be different from absorption across the GI tract. In this case, **2,3,7,8-TCDD** has a GRAF of **0.43**.

Molecular weight adjustment factors (MWAf) are only used when a toxic metal has a cancer potency factor. For most of the Hot Spots toxic metals, the OEHHa cancer potency factor applies to the weight of the toxic metal atom contained in the overall

compound. Some of the Hot Spots compounds contain various elements along with the toxic metal atom (e.g., “Nickel hydroxide”, CAS number 12054-48-7, with formula H_2NiO_2). An adjustment to the reported pounds of the overall compound may be needed to ensure that the cancer potency factor is applied only to the fraction of the overall weight of the emissions that are associated with health effects. In other cases, Hot Spots pollutants are already reported as their atom equivalent (e.g., CAS 7440-02-0, “Nickel”), and these cases do not use any further molecular weight adjustment. In our example, none of the pollutants use a ***MolWtCorrection***. Thus, each factor is **1**.

The dermal absorption factor is a chemical-specific, unitless factor that, in conjunction with surface area of skin exposed, body weight, soil loading or soil adherence of contaminated soil on skin, and exposure frequency, calculates dermal exposure to the pollutant.

11. Risk to Target Organs by Chronic 8-Hour Inhalation Exposure

	CB	CC	CD
1	80	81	82
2	InhalationChronicREL_8HR	InhalationChronicCV_8HR	InhalationChronicCNS_8HR
3		FALSE	FALSE
4	9	FALSE	FALSE
5	9	FALSE	FALSE
6		FALSE	FALSE
7		FALSE	FALSE

Column Name	Column Number	Description
InhalationChronicREL_8HR	80	Non-cancer inhalation 8-hour chronic reference exposure level (ug/m ³).
InhalationChronicCV_8HR	81	Flag indicating whether this chemical has an 8-hour chronic effect on the cardiovascular system through the inhalation pathway.
InhalationChronicCNS_8HR	82	Flag indicating whether this chemical has an 8-hour chronic effect on the central nervous system through the inhalation pathway.

	CE	CF	CG
1	83	84	85
2	InhalationChronicIMMUN_8HR	InhalationChronicKIDNEY_8HR	InhalationChronicGILV_8HR
3	FALSE	FALSE	FALSE
4	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE
8			

Column Name	Column Number	Description
InhalationChronicIMMUN_8HR	83	Flag indicating whether this chemical has an 8-hour chronic effect on the immune system through the inhalation pathway.
InhalationChronicKIDNEY_8HR	84	Flag indicating whether this chemical has an 8-hour chronic effect on the kidneys through the inhalation pathway.
InhalationChronicGILV_8HR	85	Flag indicating whether this chemical has an 8-hour chronic effect on the gastrointestinal system or liver through the inhalation pathway.

	CH	CI	CJ
1	86	87	88
2	InhalationChronicREPRO_DEVEL_8HR	InhalationChronicRESP_8HR	InhalationChronicSKIN_8HR
3	FALSE	FALSE	FALSE
4	FALSE	TRUE	FALSE
5	FALSE	TRUE	FALSE
6	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE

Column Name	Column Number	Description
InhalationChronicREPRO_DEVEL_8HR	86	Flag indicating whether this chemical has an 8-hour chronic effect on the reproductive or developmental systems through the inhalation pathway.
InhalationChronicRESP_8HR	87	Flag indicating whether this chemical has an 8-hour chronic effect on the respiratory system through the inhalation pathway.
InhalationChronicSKIN_8HR	88	Flag indicating whether this chemical has an 8-hour chronic effect on skin through the inhalation pathway.

	CK	CL	CM
1	89	90	91
2	InhalationChronicEYE_8HR	InhalationChronicBONE_TEETH_8HR	InhalationChronicENDO_8HR
3	FALSE	FALSE	FALSE
4	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE

Column Name	Column Number	Description
InhalationChronic EYE_8HR	89	Flag indicating whether this chemical has an 8-hour chronic effect on the eyes through the inhalation pathway.
InhalationChronic BONE_TEETH_8 HR	90	Flag indicating whether this chemical has an 8-hour chronic effect on the skeletal system through the inhalation pathway.
InhalationChronic ENDO_8HR	91	Flag indicating whether this chemical has an 8-hour chronic effect on the endocrine system through the inhalation pathway.

	CN	CO	CP
1	92	93	94
2	InhalationChronicBLOOD_8HR	InhalationChronicODOR_8HR	InhalationChronicGENERAL_8HR
3	FALSE	FALSE	FALSE
4	FALSE	FALSE	FALSE
5	FALSE	FALSE	FALSE
6	FALSE	FALSE	FALSE
7	FALSE	FALSE	FALSE

Column Name	Column Number	Description
InhalationChronic BLOOD_8HR	92	Flag indicating whether this chemical has an 8-hour chronic effect on the hematological system, through the inhalation pathway.
InhalationChronic ODOR_8HR	93	Flag indicating whether this chemical has an 8-hour chronic effect on the physiological response to odors through the inhalation pathway.
InhalationChronic GENERAL_8HR	94	Flag indicating whether this chemical has an 8-hour chronic general toxicity through the inhalation pathway.

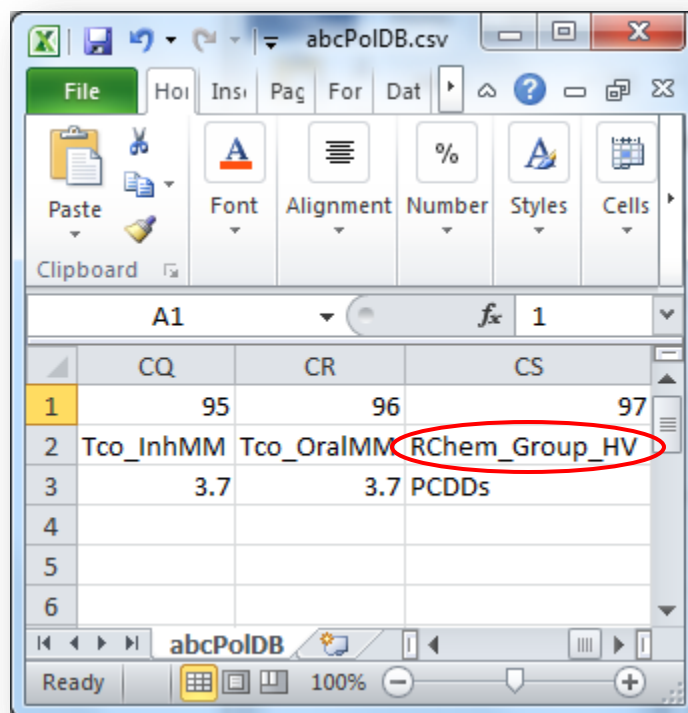
12. Pollutant to Mother's Milk Transfer Coefficients

	CQ	CR	CS
1	95	96	97
2	Tco_InhMM	Tco_OralMM	RChem_Group_HV
3	3.7	3.7	PCDDs
4			
5			
6			

Column Name	Column Number	Description
Tco_InhMM	95	Biotransfer coefficient from inhalation to mother's milk.
Tco_OralMM	96	Biotransfer coefficient from ingestion to mother's milk.

Inhalation transfer coefficients are applied to the mother's chronic daily dose of a pollutant in order to estimate a chemical concentration in her milk. Oral transfer coefficients are used to estimate how much of the chemical is absorbed by the infant from breastfeeding. Transfer coefficients are used for dioxins, furans, dioxin-like PCBs, PAHs and lead. **2,3,7,8-TCDD** (row 3) is a polychlorinated dibenzo-p-dioxin, and thus has an inhalation and oral Tco of **3.7**.

13. Chemical Group



Column Name	Column Number	Description
RChem_Group_HV	97	Chemical group.

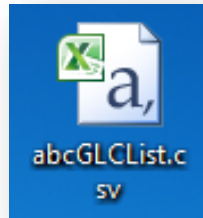
2,3,7,8-TCDD belongs to the polychlorinated dibenzo-p-dioxin (**PCDD**) group of compounds. Blank cells indicate the pollutant does not have a specified chemical group name (e.g., **Formaldehyde**).

4. GLCList.csv File

GLCList.csv is the input file exported or used by the module that contains your list of facility pollutants with their corresponding ground level concentrations (GLC).

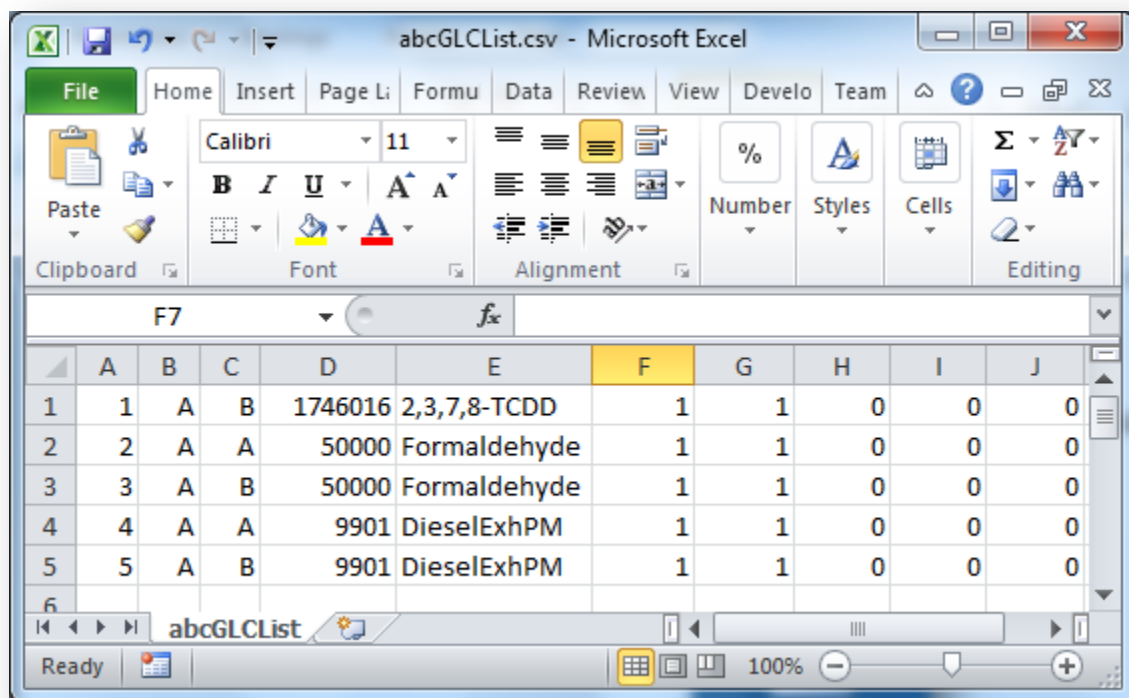
A. Opening and Viewing Content

Find the location at which you saved the GLCList.csv file and double-click its icon to open.



The filename will begin with the prefix you designated in the **Calculate Risk** screen. In this case it is **abc** to make **abcGLCList.csv**.

B. Understanding File Content

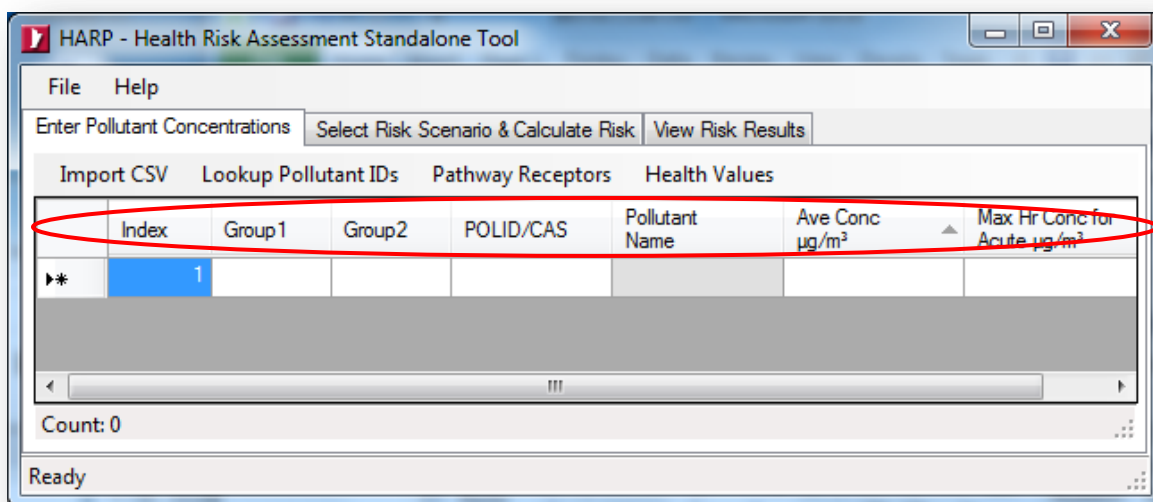


	A	B	C	D	E	F	G	H	I	J
1	1	A	B	1746016	2,3,7,8-TCDD	1	1	0	0	0
2	2	A	A	50000	Formaldehyde	1	1	0	0	0
3	3	A	B	50000	Formaldehyde	1	1	0	0	0
4	4	A	A	9901	DieselExhPM	1	1	0	0	0
5	5	A	B	9901	DieselExhPM	1	1	0	0	0
6										

GLCList.csv contains the same values entered in the module's first tab, the **Enter Pollutant Concentrations** table. The file is comprised of columns representing (in order):

- Index
- Group1
- Group2 (*RAST*), NETID (*ADMRT*)
- POLID/CAS
- Pollutant Name
- Ave Conc $\mu\text{g}/\text{m}^3$
- Max Hr Conc for Acute $\mu\text{g}/\text{m}^3$
- Pasture
- Fish $\mu\text{g}/\text{m}^3$
- Water $\mu\text{g}/\text{m}^3$

Although column labels are excluded from the CSV file, they can be seen in the module.

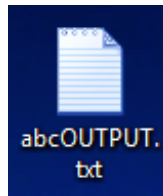


5. OUTPUT.txt File

OUTPUT.txt file is the output file log exported by HARP 2 that summarizes the run content to verify the inputs loaded successfully to run an HRA.

A. Opening and Viewing Content

Find the location at which you saved the Output.txt file and double-click its icon to open.



The filename will begin with the prefix you designated in the ***Calculate Risk*** screen followed by OUTPUT.txt. In this example it is ***abcOUTPUT.txt***.

B. Understanding File Content

Below is what your output file will look like.

```
abcOUTPUT.txt - Notepad
File Edit Format View Help

HARP2 - HRACalc (dated 15054) 2/23/2015 3:00:43 PM - Output Log

GLCs loaded successfully
Pollutants loaded successfully
*****
Start Age: -0.25
Total Exposure Duration: 70
*****
Exposure Duration Bin Distribution
3rd Trimester Bin: 0.25
0<2 Years Bin: 2
2<9 Years Bin: 0
2<16 Years Bin: 14
16<30 Years Bin: 0
16 to 70 Years Bin: 54
*****
Pathways Enabled
Inhalation: True
Soil: True
Dermal: True
Mother's Milk: True
Water: False
Fish: False
Homegrown Crops: False
Beef: False
Dairy: False
Pig: False
Chicken: False
Egg: False
calculating cancer risk
Cancer risk saved to: C:\Projects\RAMtest1CancerRisk.csv
HRA ran successfully
```

GLC's loaded successfully

Pollutants loaded successfully

Start Age (yrs)

Total Exposure Duration (yrs)

Exposure Duration Bin Distribution: Separates the **Exposure Duration** into year categories.

Pathways Enabled: True
Disabled: False

Type of Risk being calculated

Confirmation the HRA ran successfully

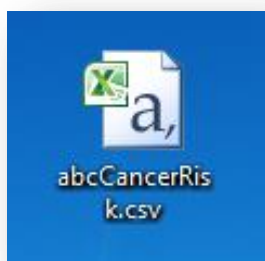
Location of where the output file is saved.

6. Risk.csv File

Risk.csv files are the output documents exported by HARP 2 that contain cancer risk and/or noncancer chronic hazard index results. Each risk file, indicated by its prefix, belongs to either a cancer, chronic, 8-hour chronic, or acute assessment.

A. Opening and Viewing Content

Find the Risk.csv file icon and double-click to open.



The filename will begin with the assessment type (e.g., Cancer, Chronic, Acute) and the prefix, like **abcCancerRisk.csv**. The fields in the file will differ between cancer assessments and noncancer assessments. Both are covered in the following sections.

B. Understanding Cancer Risk File Content

A cancer risk CSV file contains total risk and risk broken down by pathway (e.g., inhalation, soil, dermal).

Below is a screenshot of what your CSV might look like. The first row gives information about when the file was created and what type of assessment it is. In this case, the CSV was created on **1/20/2015** at **3:15** and is a **Cancer Risk** assessment.

	A	B	C	D	E	F	G	H
1	*HARP - HRACalc v1.0 1/30/2015 3:15:32 PM - Cancer Risk							
2	INDEX	GRP1	GRP2	POLID	POLABBREV	CONC	RISK_SUM	SCENARIO
3	1	A	B	1746016	2,3,7,8-TCDD	1	8.28E+01	30YrCancerDerived
4	2	A	A	50000	Formaldehyde	1	1.34E-05	30YrCancerDerived
5	3	A	B	50000	Formaldehyde	1	1.34E-05	30YrCancerDerived
6	4	A	A	9901	DieselExhPM	1	7.01E-04	30YrCancerDerived
7	5	A	B	9901	DieselExhPM	1	7.01E-04	30YrCancerDerived
8								

The following rows include 1) pollutant identification, 2) annual average concentration, 3) cancer risk sum probability, 4) cancer risk assessment scenario, 5) cancer risk breakdown by pathway, and 6) pasture, fish, and water GLCs.

1. Pollutant Identification

	A	B	C	D	E	F	G
1	*HARP - HRACalc v1.0 1/30/2015 3:15:32 PM - Cancer Risk						
2	INDEX	GRP1	GRP2	POLID	POLABBREV	CONC	RISK_SUM
3	1	A	B	1746016	2,3,7,8-TCDD	1	8.28E+01
4	2	A	A	50000	Formaldehyde	1	1.34E-05
5	3	A	B	50000	Formaldehyde	1	1.34E-05
6	4	A	A	9901	DieselExhPM	1	7.01E-04
7	5	A	B	9901	DieselExhPM	1	7.01E-04

Column Name	Column Number	Description
INDEX	A	Index number.
GRP1	B	Pollutant group description 1 or x-axis.
GRP2 (RAST) NETID (ADMRT)	C	Pollutant group description 2 or y-axis.
POLID	D	Pollutant identification number.
POLABBREV	E	Pollutant name abbreviation.

2. Annual average Concentration

	A	B	C	D	E	F	G
1	*HARP - HRACalc v1.0 1/30/2015 3:15:32 PM - Cancer Risk						
2	INDEX	GRP1	GRP2	POLID	POLABBREV	CONC	RISK_SUM
3	1	A	B	1746016	2,3,7,8-TCDD	1	8.28E+01
4	2	A	A	50000	Formaldehyde	1	1.34E-05
5	3	A	B	50000	Formaldehyde	1	1.34E-05
6	4	A	A	9901	DieselExhPM	1	7.01E-04
7	5	A	B	9901	DieselExhPM	1	7.01E-04

Column Name	Column Number	Description
CONC	F	Annual average concentration in $\mu\text{g}/\text{m}^3$.

3. Cancer Risk Sum Probability

	C	D	E	F	G	H
1	v1.0 1/30/2015 3:15:32 PM - Cancer Risk					
2	GRP2	POLID	POLABBREV	CONC	RISK_SUM	SCENARIO
3	B	1746016	2,3,7,8-TCDD	1	8.28E+01	30YrCancerDeriv
4	A	50000	Formaldehyde	1	1.34E-05	30YrCancerDeriv
5	B	50000	Formaldehyde	1	1.34E-05	30YrCancerDeriv
6	A	9901	DieselExhPM	1	7.01E-04	30YrCancerDeriv
7	B	9901	DieselExhPM	1	7.01E-04	30YrCancerDeriv

Column Name	Column Number	Description
RISK_SUM	G	Probability of developing cancer from that pollutant at the specified exposure scenario.

4. Cancer HRA Scenario

The **SCENARIO** column describes the duration of exposure to the pollutant, what health risk is being measured, and what intake rate percentile method was used to determine exposure frequency. In this example, **30YrCancerDerived** means that the receptor was exposed to the pollutant for 30 years, assessed for cancer risk, and that the method used to determine the receptor's intake rate of the pollutant was the derived method.

	E	F	G	H	I	
1	3:15:32 PM - Cancer Risk					
2	POLABBREV	CONC	RISK_SUM	SCENARIO	DETAILS	IN
3	2,3,7,8-TCDD	1	8.28E+01	30YrCancerDerived	*	8
4	Formaldehyde	1	1.34E-05	30YrCancerDerived	*	1
5	Formaldehyde	1	1.34E-05	30YrCancerDerived	*	1
6	DieselExhPM	1	7.01E-04	30YrCancerDerived	*	7
7	DieselExhPM	1	7.01E-04	30YrCancerDerived	*	7

Column Name	Column Number	Description
SCENARIO	H	Scenario in which receptor is exposed to pollutants (duration, exposure method, etc.).

Column **I, DETAILS**, is a table break. Therefore, it will not display any data.

5. Cancer Risk Breakdown by Pathway

	J	K	L	M	N	O	P	Q	R	S
1										
2	INH_RISK	SOIL_RISK	DERMAL_RISK	MMILK_RISK	WATER_RISK	FISH_RISK	CROP_RISK	BEEF_RISK	DAIRY_RISK	PIG_RISK
3	8.28E+01	8.00E-05	1.50E-05	5.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4	1.34E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5	1.34E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6	7.01E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	7.01E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
8										
9										

Column Name	Column Number	Description
INH_RISK	J	Portion of total cancer probability coming from inhalation.
SOIL_RISK	K	Portion of total cancer probability coming from soil.
DERMAL_RISK	L	Portion of total cancer probability coming from dermal.
MMILK_RISK	M	Portion of total cancer probability coming from mother's milk.
WATER_RISK	N	Portion of total cancer probability coming from water.
FISH_RISK	O	Portion of total cancer probability coming from fish.
CROP_RISK	P	Portion of total cancer probability coming from crops.

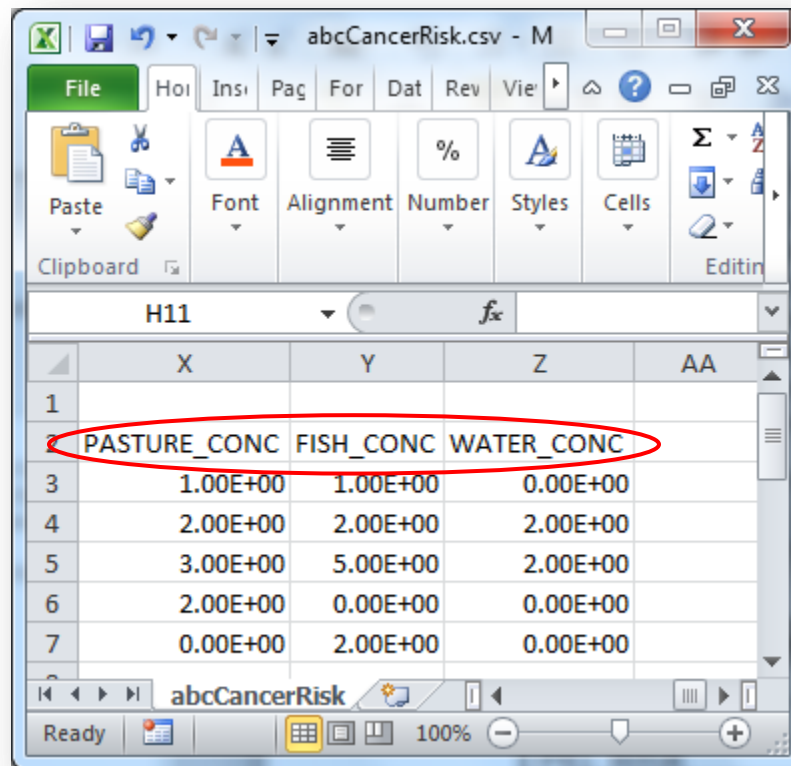
1ST_DRIVER and **2ND_DRIVER** show what pathways of pollutant exposure contributed to the most probability of developing cancer. For the first pollutant in column 3, **INHALATION** contributed the most probability for developing cancer while **MMILK** (mother's milk) contributed the second-most probability.

	P	Q	R	S	T	U	V	W	X
1									
2	CROP_RISK	BEEF_RISK	DAIRY_RISK	PIG_RISK	CHICKEN_RISK	EGG_RISK	1ST_DRIVER	2ND_DRIVER	PASTURE_CONC
3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	MMILK	1.00E+00
4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION		2.00E+00
5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION		3.00E+00
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION		2.00E+00
7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION		0.00E+00

Column Name	Column Number	Description
BEEF_RISK	Q	Portion of total cancer probability coming from beef.
DAIRY_RISK	R	Portion of total cancer probability coming from dairy.
PIG_RISK	S	Portion of total cancer probability coming from pig.
CHICKEN_RISK	T	Portion of total cancer probability coming from chicken.
EGG_RISK	U	Portion of total cancer probability coming from eggs.
1ST_DRIVER	V	Primary risk contributing pathway.
2ND_DRIVER	W	Second greatest risk contributing pathway.

6. Pasture, Fish, and Water GLCs

Columns **X**, **Y**, and **Z** contain pollutant GLCs over areas of pasture, fish, and/or water at the receptor.



	X	Y	Z	AA
1				
2	PASTURE_CONC	FISH_CONC	WATER_CONC	
3	1.00E+00	1.00E+00	0.00E+00	
4	2.00E+00	2.00E+00	2.00E+00	
5	3.00E+00	5.00E+00	2.00E+00	
6	2.00E+00	0.00E+00	0.00E+00	
7	0.00E+00	2.00E+00	0.00E+00	

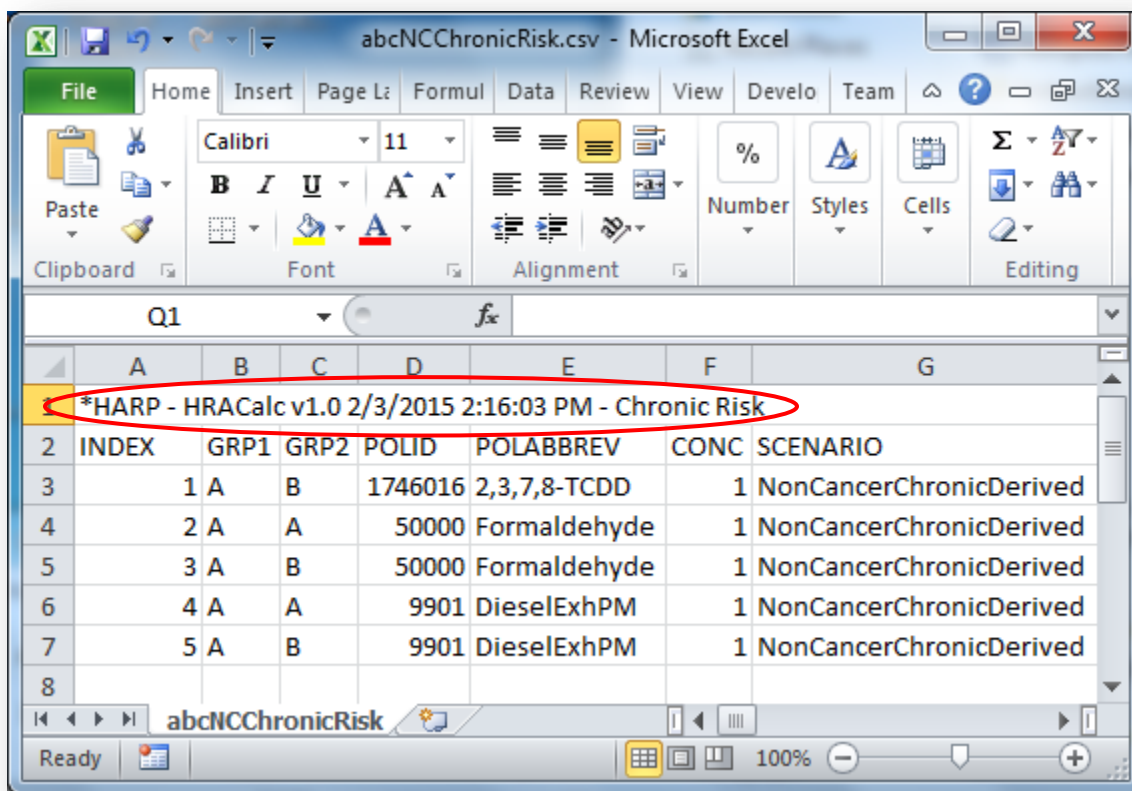
Column Name	Column Number	Description
PASTURE_CONC	X	Ground level concentration of pollutant over pasture at receptor point.
FISH_CONC	Y	Ground level concentration of pollutant over fish at receptor point.
WATER_CONC	Z	Ground level concentration of pollutant over water at receptor point.

C. Understanding Noncancer Risk File Content

A noncancer risk results file looks similar to a cancer risk file. However, instead of evaluating cancer probability with a risk sum, the file evaluates risk to target organs with a hazard index (HI).

Like a cancer risk results file, a noncancer file contains a breakdown of risk by pathway. For a noncancer assessment, risk is broken down by the dosage received from each pathway.

Below is a screenshot of what your CSV might look like in a spreadsheet. The first row gives information about when the file was created and what type of assessment it is. In this case, it is a **Chronic Risk** assessment.



	A	B	C	D	E	F	G
1	*HARP - HRACalc v1.0 2/3/2015 2:16:03 PM - Chronic Risk						
2	INDEX	GRP1	GRP2	POLID	POLABBREV	CONC	SCENARIO
3	1	A	B	1746016	2,3,7,8-TCDD	1	NonCancerChronicDerived
4	2	A	A	50000	Formaldehyde	1	NonCancerChronicDerived
5	3	A	B	50000	Formaldehyde	1	NonCancerChronicDerived
6	4	A	A	9901	DieselExhPM	1	NonCancerChronicDerived
7	5	A	B	9901	DieselExhPM	1	NonCancerChronicDerived
8							

Columns will be covered in groups 1) pollutant identification, 2) concentration (annual average or maximum one-hour concentration for acute assessments), 3) noncancer risk assessment scenario, 4) hazard index by target organ, 5) pollutant dose by pathway, and 6) pasture, fish, and water GLCs.

1. Pollutant Identification

INDEX	GRP1	GRP2	POLID	POLABBREV	CONC	SCENARIO
1	A	B	1746016	2,3,7,8-TCDD	1	NonCancerChronicDerived
2	A	A	50000	Formaldehyde	1	NonCancerChronicDerived
3	A	B	50000	Formaldehyde	1	NonCancerChronicDerived
4	A	A	9901	DieselExhPM	1	NonCancerChronicDerived
5	A	B	9901	DieselExhPM	1	NonCancerChronicDerived

Column Name	Column Number	Description
INDEX	A	Index number.
GRP1	B	Pollutant group description 1 or x-axis.
GRP2 (RAST) NETID (ADMRT)	C	Pollutant group description 2 or y-axis.
POLID	D	Pollutant identification number.
POLABBREV	E	Pollutant name abbreviation.

2. Concentration

Depending on your HRA type, **CONC** is either the annual average or one-hour maximum ground level concentration, expressed in $\mu\text{g}/\text{m}^3$.

INDEX	GRP1	GRP2	POLID	POLABBREV	CONC	SCENARIO
1	A	B	1746016	2,3,7,8-TCDD	1	NonCancerChronicDerived
2	A	A	50000	Formaldehyde	1	NonCancerChronicDerived
3	A	B	50000	Formaldehyde	1	NonCancerChronicDerived
4	A	A	9901	DieselExhPM	1	NonCancerChronicDerived
5	A	B	9901	DieselExhPM	1	NonCancerChronicDerived

Column Name	Column Number	Description
CONC	F	Annual average concentration in $\mu\text{g}/\text{m}^3$ for chronic assessments and one-hour maximum concentration in $\mu\text{g}/\text{m}^3$ for noncancer acute assessments.

3. Noncancer HRA Scenario

The **SCENARIO** column describes what health risk is being measured, and what intake rate percentile method was used to determine exposure frequency. In this example, **NonCancerChronicDerived** means that the receptor was assessed for chronic risk to target organs, and that the method used to determine the receptor's intake rate of the pollutant was the derived method.

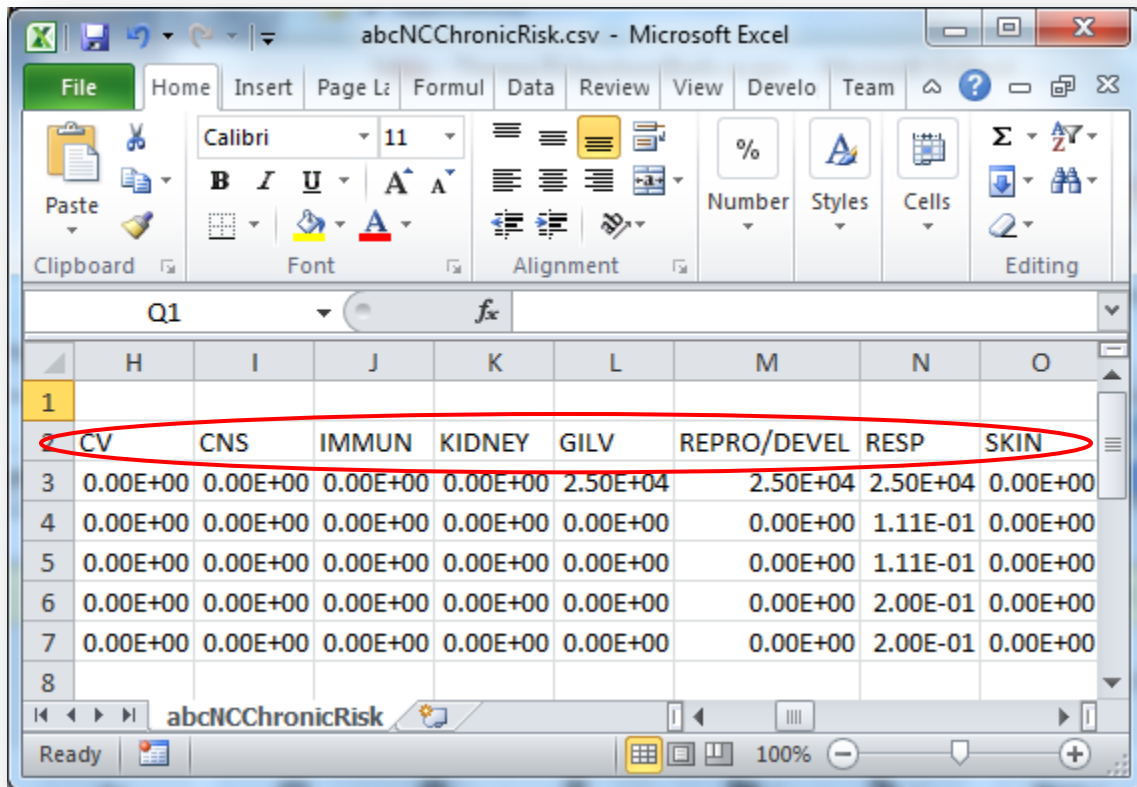
	B	C	D	E	F	G
1	RACalc v1.0 2/3/2015 2:16:03 PM - Chronic Risk					
2	GRP1	GRP2	POLID	POLABBREV	CONC	SCENARIO
3	A	B	1746016	2,3,7,8-TCDD	1	NonCancerChronicDerived
4	A	A	50000	Formaldehyde	1	NonCancerChronicDerived
5	A	B	50000	Formaldehyde	1	NonCancerChronicDerived
6	A	A	9901	DieselExhPM	1	NonCancerChronicDerived
7	A	B	9901	DieselExhPM	1	NonCancerChronicDerived

Column Name	Column Number	Description
SCENARIO	G	Scenario in which receptor is exposed to pollutants (duration, exposure method, etc.).

Column **H, DETAILS**, is a table break and does not contain data.

4. Hazard Index by Target Organ

A hazard index is the calculated pollutant-specific indicator for risk of developing an adverse health outcome at a target organ system. This is estimated using the predefined reference exposure level (REL) of a pollutant, a concentration below which there is assumed to be no observable adverse health impact to a target organ system.



	H	I	J	K	L	M	N	O
1	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL	RESP	SKIN
3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+04	2.50E+04	2.50E+04	0.00E+00
4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-01	0.00E+00
5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-01	0.00E+00
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-01	0.00E+00
7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-01	0.00E+00
8								

Column Name	Column Number	Description
CV	H	Hazard index to the cardiovascular system.
CNS	I	Hazard index to the central nervous system.
IMMUN	J	Hazard index to the immune system.
KIDNEY	K	Hazard index to the kidneys.
GILV	L	Hazard index to the gastrointestinal system and liver.
REPRO/DEVEL	M	Hazard index to the reproductive and developmental system.
RESP	N	Hazard index to the respiratory system.
SKIN	O	Hazard index to the skin.

	P	Q	R	S	T	U	V
1	EYE	BONE/TEETH	ENDO	BLOOD	ODOR	GENERAL	DETAILS
3	0.00E+00	0.00E+00	2.50E+04	2.50E+04	0.00E+00	0.00E+00	*
4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*
5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*
7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*

Column Name	Column Number	Description
EYE	P	Hazard index to the eyes.
BONE/TEETH	Q	Hazard index to the skeletal system.
ENDO	R	Hazard index to the endocrine system.
BLOOD	S	Hazard index to the hematological system.
ODOR	T	Hazard index to the physiological response to odors.
GENERAL	U	Other hazard or general toxicity.

Column **V, DETAILS**, is a table break and does not contain data.

5. Pollutant Dose by Pathway

Pollutant dosage in milligrams per kilograms of bodyweight per day is calculated for noncancer chronic assessments. They are not available in the risk results of noncancer acute assessments.

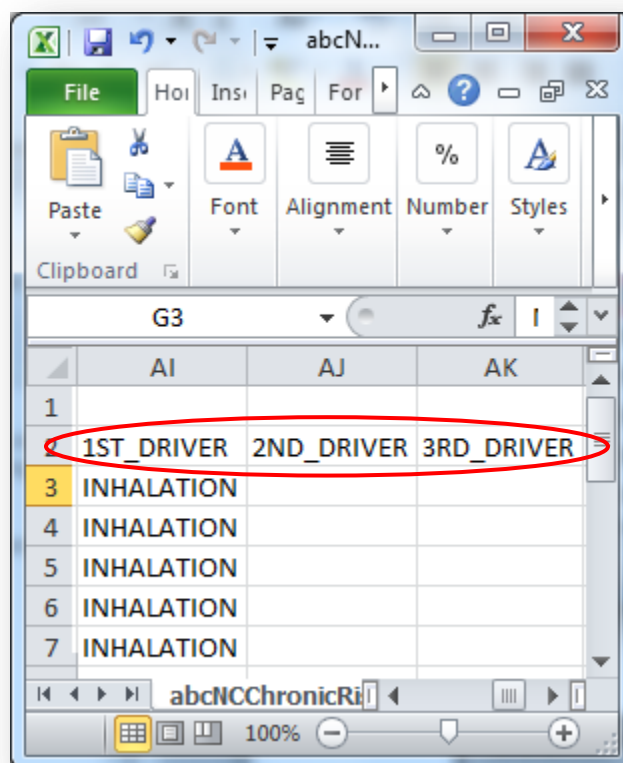
	W	X	Y	Z	AA	AB
1						
2	INH_CONC	SOIL_DOSE	DERMAL_DOSE	MMILK_DOSE	WATER_DOSE	FISH_DOSE
3	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Column Name	Column Number	Description
INH_CONC	W	Inhalation concentration in $\mu\text{g}/\text{m}^3$.
SOIL_DOSE	X	Dose in mg/kg bw/d from soil.
DERMAL_DOSE	Y	Dose in mg/kg bw/d from dermal uptake.
MMILK_DOSE	Z	Dose in mg/kg bw/d from mother's milk.
WATER_DOSE	AA	Dose in mg/kg bw/d from drinking water.
FISH_DOSE	AB	Dose in mg/kg bw/d from fish.

	AC	AD	AE	AF	AG	AH
1						
2	CROP_DOSE	BEEF_DOSE	DAIRY_DOSE	PIG_DOSE	CHICKEN_DOSE	EGG_DOSE
3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Column Name	Column Number	Description
CROP_DOSE	AC	Dose in mg/kg bw/d from homegrown produce.
BEEF_DOSE	AD	Dose in mg/kg bw/d from beef.
DAIRY_DOSE	AE	Dose in mg/kg bw/d from dairy.
PIG_DOSE	AF	Dose in mg/kg bw/d from pig.
CHICKEN_DOSE	AG	Dose in mg/kg bw/d from drinking water.
EGG_DOSE	AH	Dose in mg/kg bw/d from eggs.

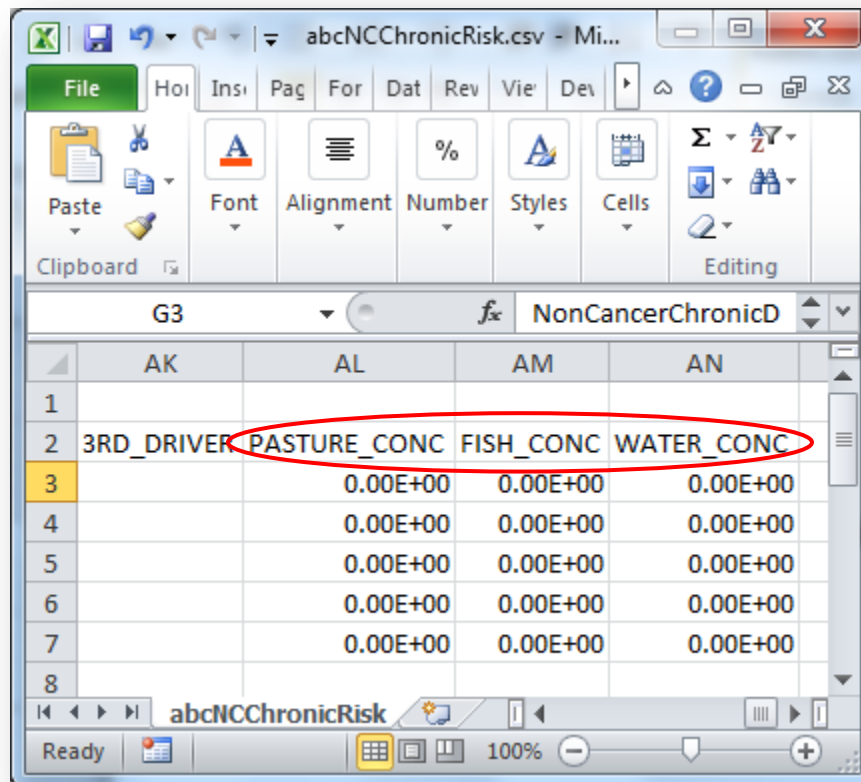
1ST_DRIVER, **2ND_DRIVER**, and **3rd_DRIVER** show what pathways of exposure contributed to the most risk for developing an adverse health outcome to a target organ. **INHALATION** contributed the most probability from all pollutants. Inhalation will be the only driving pathway for an inhalation-only assessment. In addition, acute assessments are always inhalation-only and do not contain these columns in their risk results file.



Column Name	Column Number	Description
CROP_DOSE	AC	Primary risk contributing pathway.
BEEF_DOSE	AD	Second greatest risk contributing pathway.
DAIRY_DOSE	AE	Third greatest risk contributing pathway.

6. Pasture, Fish, & Water GLCs

Columns **AL**, **AM**, and **AN** contain pollutant GLCs over areas of pasture, fish, and/or water at the receptor. You provided this information under Pathway Receptors. An acute assessment will not include these columns.



	AK	AL	AM	AN
1				
2	3RD_DRIVER	PASTURE_CONC	FISH_CONC	WATER_CONC
3		0.00E+00	0.00E+00	0.00E+00
4		0.00E+00	0.00E+00	0.00E+00
5		0.00E+00	0.00E+00	0.00E+00
6		0.00E+00	0.00E+00	0.00E+00
7		0.00E+00	0.00E+00	0.00E+00
8				

Column Name	Column Number	Description
PASTURE_CONC	AL	Ground level concentration of pollutant over pasture at receptor point.
FISH_CONC	AM	Ground level concentration of pollutant over fish at receptor point.
WATER_CONC	AN	Ground level concentration of pollutant over water at receptor point.